Installing, Operating & Maintaining

MUNCHKIN™ HIGH EFFICIENCY 399M COMMERCIAL BOILER

WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch: do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department. Installation and service must be performed by a qualified installer, service agency or the gas supplier.

CONTROLS

MH27745 US LISTED

C US

member gama

WARNING

This manual must only be used by a qualified heating installer / service technician. Failure to comply could result in severe personal injury, death or substantial property damage. It is also important to keep these Instructions with the appliance.

HEAT TRANSFER PRODUCTS, INC.
120 BRALEY RD., E. FREETOWN, MA 02717

USING THIS MANUAL

SPECIAL ATTENTION BOXES

Throughout this manual you will see these special attention boxes similar to this one, which are intended to supplement the instructions and make special notice of potential hazards. These categories mean, in the judgement of Heat Transfer Products, Inc.:

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION Indicates a potentially hazardous situtation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

⚠ WARNINGS

- THIS UNIT IS FOR CATEGORY IV VENTING - 2 PIPE ONLY. THIS IS A SEALED COMBUSTION APPLIANCE.
- THIS HEATER INSTALLATION MUST CONFORM TO THE LATEST EDITION OF THE "NATIONAL FUEL GAS CODE" ANSI Z223.1 NFPA 54 AND OR CAN/CGA B149 INSTALLATION CODES. STATE AND LOCAL CODES MIGHT ALSO APPLY TO INSTALLATION.
- WHERE REQUIRED BY THE AUTHORITY HAVING JURISDICTION, THE INSTALLATION MUST CONFORM TO THE STANDARDS FOR CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED HEATERS, ANSI/ASME HEATER AND PRESSURE VESSEL CODE, Section IV, ALONG WITH CSD1.
- THE HEATER, GAS PIPING, WATER PIPING, VENTING AND ELECTRICAL MUST BE INSTALLED BY TRAINED & QUALIFIED PERSONNEL FAMILIAR WITH INSTALLATION PRACTICES, LOCAL CODE, LICENSING REQUIREMENTS.
- IF THE INFORMATION IN THESE INSTRUCTIONS ARE NOT FOLLOWED EXACTLY, A FIRE OR EXPLOSION MAY RESULT; CAUSING PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.
- DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE;
- THE USE OF A LOW WATER CUT-OFF DEVICE MAY BE REQUIRED BY STATE OR LOCAL CODES IF THE MUNCHKIN IS INSTALLED ABOVE RADIATION LEVELS.

TABLE OF CONTENTS

PART 1. GENERAL INFORMATION

A. HOW IT OPERATES

When the room thermostat calls for heat, the Munchkin control board will start the circulator and start to monitor the return temperature of the system before the heater will begin to heat the water. Once the controller has sensed a drop in the return water temperature below the temperature set point minus the differential set point, the heater will start to heat the water. This eliminates the Munchkin starting every time the thermostat calls for heat. This feature keeps the system from short cycling.

Once the system has sensed the temperature difference, the Munchkin will activate the blower motor for 5 seconds to pre-purge the system before starting the Munchkin. The Munchkin controller will now start to modulate the pre-mix burner based on analyzing the return temperature, supply water temperature and the set point temperature. By compiling this information, the controller utilizes an algorithm to fully adjust the firing rate while maintaining the desired output temperature. The pre-mix burner fan has a direct drive current low-voltage motor with a pulse relay counting. This system allows precise control over the fan speed and combustion air volumes. Coupled with the Honeywell gas valve and the Venturi system which are set to provide a one-to-one ratio of precisely measured volumes of fuel to air, an accurate and instant burner output is achieved. This keeps the Munchkin running at the **highest efficiency.**

When the thermostat is satisfied, the Munchkin will then go through a 4 second post-purge cycle before shutting off. Every Munchkin heater is equipped with a display which will read the outlet temperature of the heater and then will illuminate a green light showing flame on. If a problem occurs, the front indicator light will turn red and the display will read a fault code; see Part 7, Section B/C, pages 33 and 34.

B. MUNCHKIN RATINGS AND DIMENSIONS

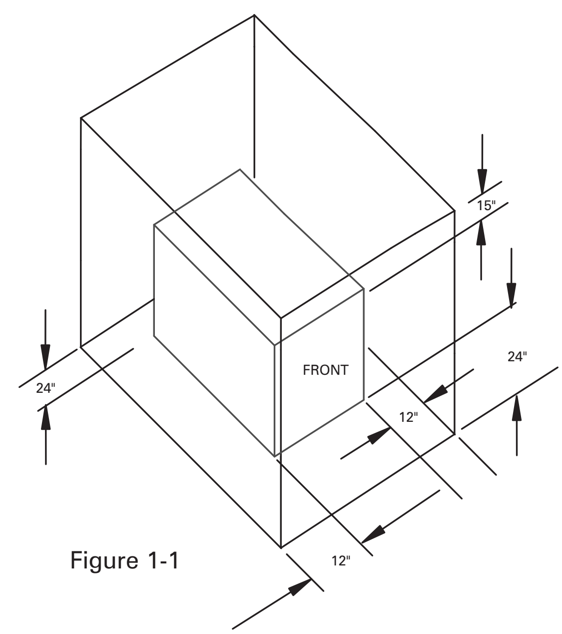
PERFORMANCE RATING

Model	Input Modulation	DOE Heating	Combustion Efficiency	Thermal Efficiency	AFUE*	Shipping Weight
399M	100,000 to 399,000	93,000 to 279,000	95%	93.35%	93%	252 lbs.

CONNECTION SIZES

Model	Supply/Return Connection	Gas Connection Size	Vent Dia.
399M	2" NPT	1-1/4"	4"

RECOMMENDED SERVICE CLEARANCES



(NOTE: The Munchkin is rated at zero clearance to combustibles.)

Figure 1-1

DIMENSIONS

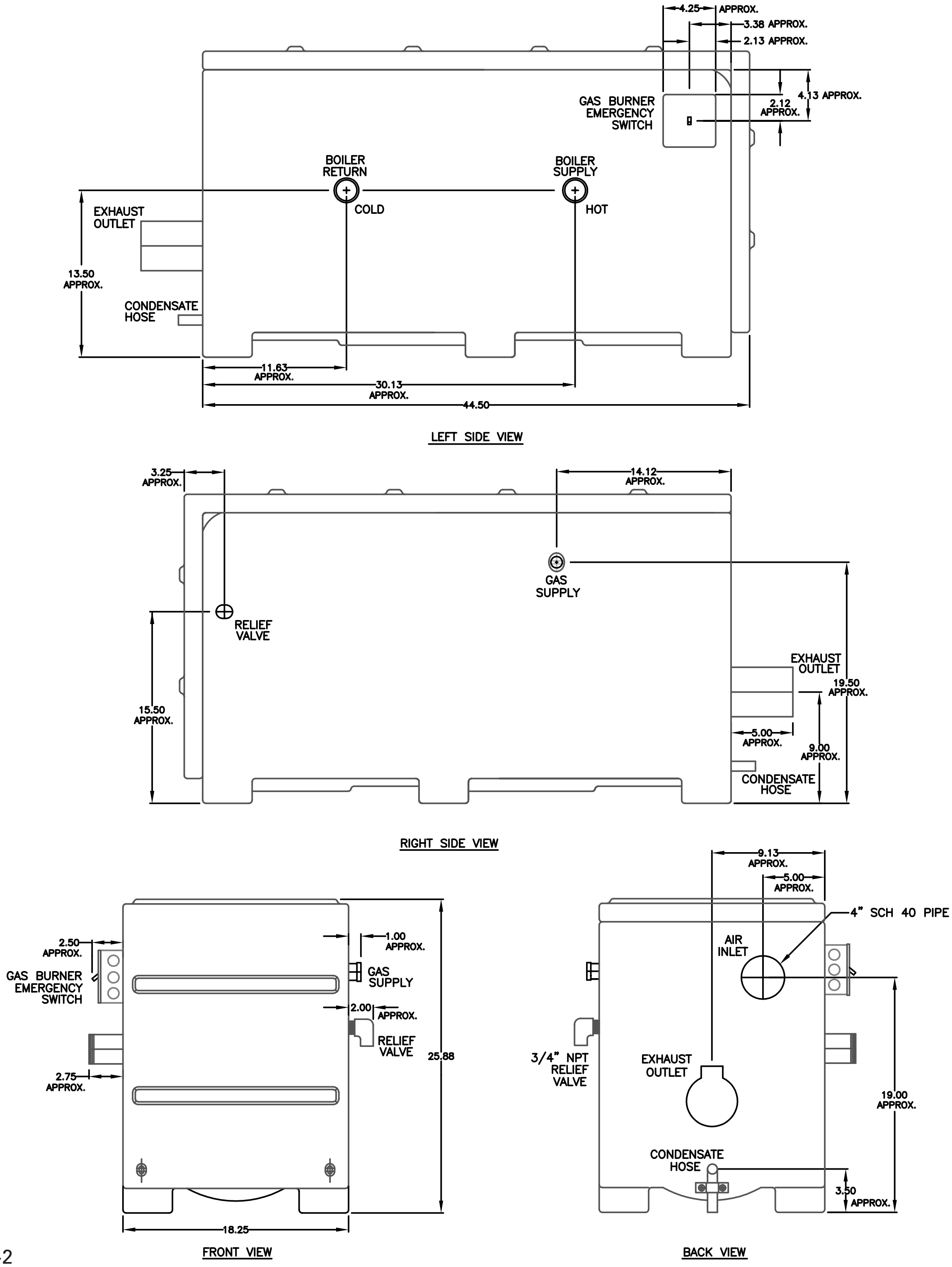


Figure 1-2

C. PRE-INSTALLATION REQUIREMENTS

The Munchkin is designed for installation on non-rated flooring, in alcoves, basements, utility rooms, and closet but never a bedroom closet. Choose a location for your Munchkin, centralized to the piping system, along with consideration for Electrical (Part 2, Page 6), Gas Connection (Part 3, Page 8) and Venting (Part 4, Page 11).

⚠ CAUTION

The Munchkin is certified as an indoor appliance. Do not install the Munchkin outdoors or locate where it will be exposed to freezing temperature. This includes all related piping and components. If the Munchkin is subjected to flood water or submersed in water, the Munchkin must be replaced.

NOTE: Service clearance of the Munchkin

1. **The front of the appliance needs 24" of clearance for service minimum. It may have a non-rated or combustible door or access panel and must have a minimum of 24" clearance.**
2. **The left side of the heater is 12" clearance**
3. **The right side of the heater is 12" clearance**
4. **The top of the heater is 15" clearance.**

If the Munchkin is set up for liquefied petroleum (LP) gas, some geographic areas follow the Uniform Mechanical Code, section 304.6, "Liquefied petroleum gas burning appliances shall not be installed in a pit, basement or similar location where heavier-than-air gas might collect. Appliances so fueled, shall not be installed in a below grade under-floor space or basement unless such location is provided with an approved means for removal of unburned gas."

⚠ CAUTION

Condensation removal: This is a condensing, high efficiency appliance, therefore condensation removal must be addressed to avoid damage to surrounding area or appliance. See Part (4) Section E for Condensate Requirements.

⚠ WARNING

D. PRESSURE RELIEF VALVE

A pressure relief valve is installed into the front right side manifold. We recommend a WATTS ¾" M 335 MI valve or equivalent and meets the requirements of ANSI/ASME Heater and Pressure Vessel Code, Section IV or CSA B51; Heater, Pressure Vessel and Piping Code as applicable for heating heaters. A ¾" pipe must be directed to a floor drain or suitable location within 6" of a drain or floor. Protect from freezing, do not plug or cap pressure relief valve. Serious explosion causing property damage and or loss of life could result. Under no circumstances should the relief valve be eliminated, capped or plugged.

PART 2. ELECTRICAL

A. ELECTRICAL CONNECTION

The electrical connection for the Munchkin is on the left hand side of the unit. There is a ½" knockout location for an electrical connection for both the incoming power and the central heating circulator connection. All electrical wiring must be performed by a qualified licensed electrician in accordance with National Electrical Code ANSI Z223.1/NFPA 54 to and/or the Canadian Electrical Code, Part 1 CSA C22.1, or to the applicable codes and standards. For your convenience, we have labeled all the wires that need to be connected to operate the Munchkin.

⚠ CAUTION

Electrical wiring on the Incoming Power and Central Heating Circulator shall be connected directly to the intended connection source and not be connected together inside the electric box provided. An Electrical Short will result and the Control board will have to be replaced! If Electrical Requirements of the Central Heating Circulator exceeds 4 amps (or 3 amps on HA models only) please follow the wiring diagrams on Page 8, Figures 2-1, 2-2 and 2-3.

The electrical requirements are for standard 120 volts, 60 Hz 15 Amp service. This unit is wired with #18 awg and fused for no more than 15 Amps.

⚠ DANGER

IT IS EXTREMELY IMPORTANT THAT THIS UNIT BE PROPERLY GROUNDED!

⚠ DANGER

IT IS VERY IMPORTANT THAT THE BUILDING GROUND IS INSPECTED BY A QUALIFIED ELECTRICIAN PRIOR TO MAKING THIS CONNECTION!

There are two ground points in the electrical compartment that must be connected to the building ground system. Connect the building ground to the green ground screw and the green ground wire inside electrical box provided.

The Incoming Power Supply is connected to the Black (Hot) and the White (Neutral).The Munchkin Control board is polarity sensitive. If the polarity is reversed, the Munchkin control will not sense a flame and lock out the system. The Orange and Brown wire are provided to the supply of 120 volts to the Central Heating Circulator. Connect the Orange (Hot) and the Brown (Neutral) directly to the Central Heating Circulator.

⚠ DANGER

The Orange wire for the Central Heating Circulator is Switched Hot and must have a wire nut if not connected to the Central Heating Circulator. Failure to follow this instruction will result in a short, and the Control Board will have to be replaced.

Connect the gray wires to your heating thermostat (TT) connection. Your thermostat heat anticipator setting is .056 amp.

CAUTION

Do not power zone valves directly from the heater transformer. Doing so will greatly reduce the life of the transformer. Use a separate transformer sized to handle the total electric load of all zone valves.

It is important that the electrical power is not turned on at this time. Double check all connections and then turn the power on. The display that is provided with the Munchkin should now be reading the outlet temperature. Note: see Part 6/Startup Procedure section in the manual to change the temperature setting or run the heater.

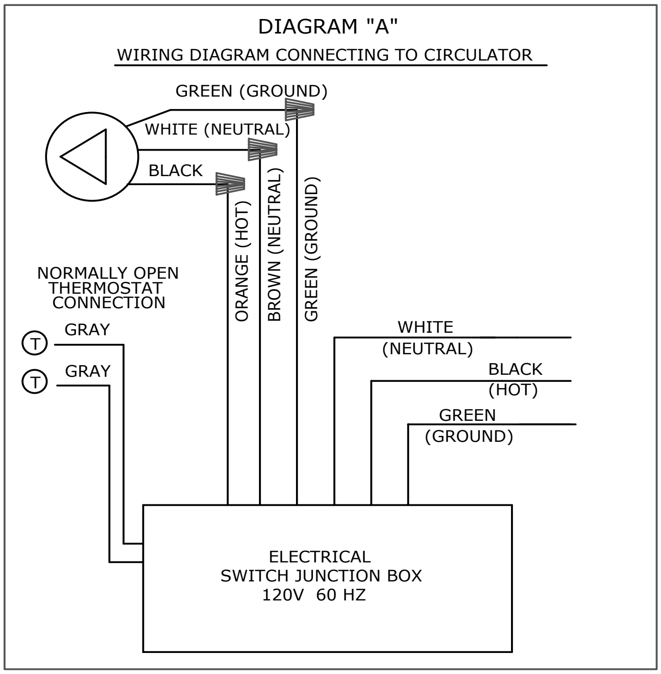


Figure 2-1: Connection Wiring Directly to Central Heating Circulator

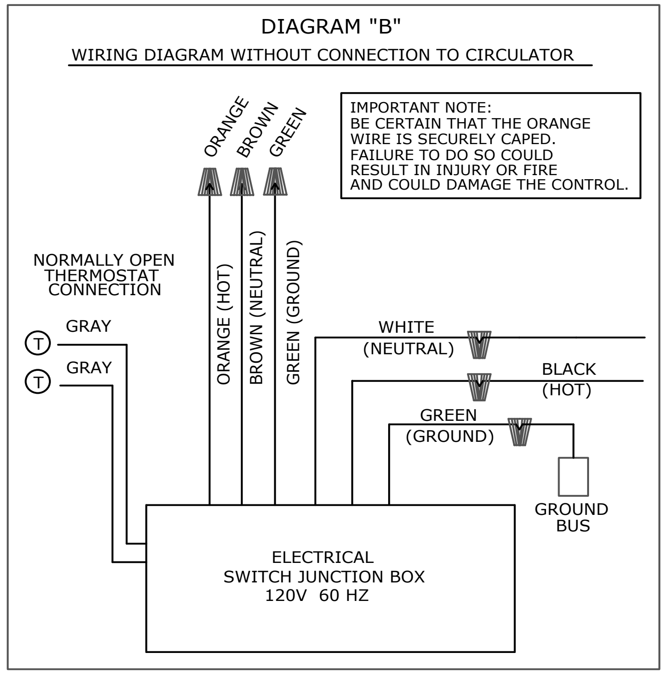
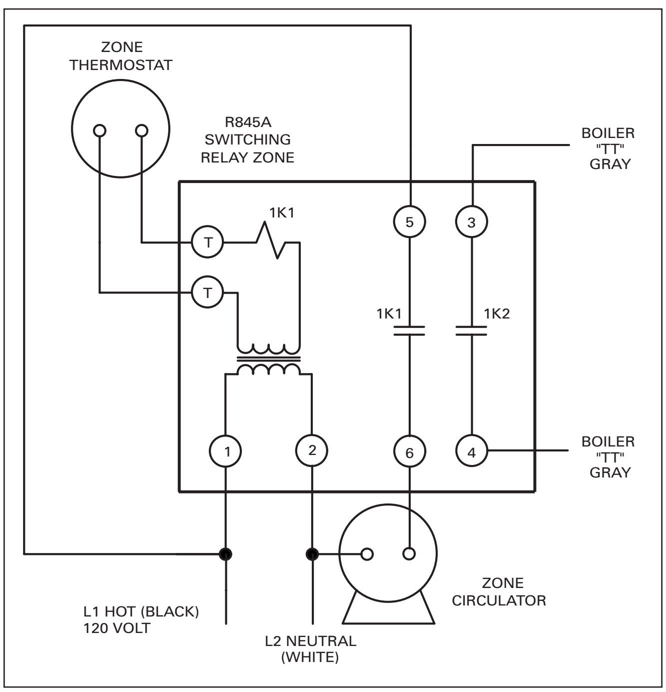


Figure 2-2: Connection Wiring without Wiring Central Heating Circulator



Note to Electrical Contractor: The **orange wire** is 120 Volt/4 Amp maximum for central heating circulator only. Loads greater than 4 amps or 3 amps for HA models only will blow the fuse on the board. The **brown wire** is the neutral wire for the central heating pump only.

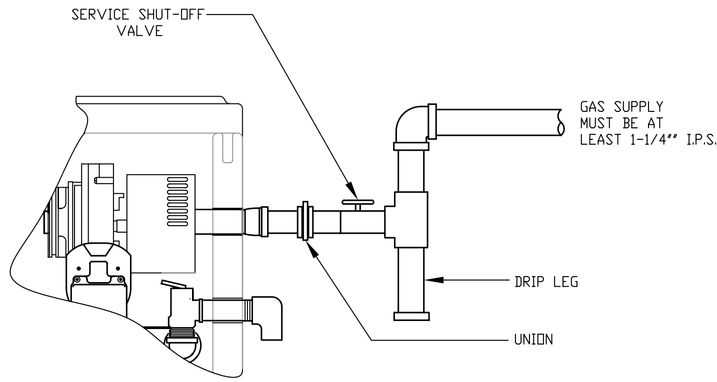
Figure 2-3: For circulator amp loads greater than 4 amps (3 amps for "HA" models) use the wiring diagram shown at left. The brown and orange wires will not be used in this application.

PART 3. GAS CONNECTION

⚠ WARNING

Failure to follow all precautions could result in fire, explosion or death!

A. GAS CONNECTION



The gas supply shall have a maximum inlet pressure of less than 14" water column (350 mm), ½ pound pressure (3.5 kPa), and a minimum of 7" water column. The entire piping system, gas meter and regulator must be sized properly to prevent pressure drop greater than 0.5" as stated in the National Fuel Gas Code. This information is listed on the rating plate. **It is very important that you are connected to the type of gas as noted on the rating plate.** "LP" for liquefied petroleum, propane gas or, "Nat" natural or city gas. All gas connections must be approved by the local gas supplier, or utility in addition to the governing authority, prior to turning the gas supply on. The nipple provided is 1¼" and it is mandatory that a 1 x 1¼" reducing coupling (provided) is used, threaded into the branch of a 1¼" tee, and a drip leg fabricated, as per the National Fuel Gas code. **You must ensure that the entire gas line to the connection at the Munchkin is no smaller than 1¼".** Once all the inspections have been performed, the piping must be leak tested. If the leak test requirement is a higher test pressure than the maximum inlet pressure, you must isolate the Munchkin from the gas line. In order to do this, you must shut the gas off using factory and field-installed gas cocks (following the lighting instructions in Part 6 Section B.) This will prevent high pressure. Failure to do so may damage the gas valve. In the event the gas valve is exposed to a pressure greater than ½ PSI, 14" water column, the gas valve must be replaced. **Never use an open flame (match, lighter, etc.) to check gas connections.**

B. GAS PIPING

1. Run the gas supply line in accordance with all applicable codes.
2. Locate and install manual shutoff valves in accordance with state and local requirements.

C. GAS TABLE

Refer to Table (1) to size the supply piping to minimize pressure drop between meter or regulator and unit.

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour for Gas Pressures of 0.5 psi or Less and a Pressure Drop of 0.3 Inch water Column

(TABLE 1) **(Based on a 0.60 Specific Gravity Gas)**

Nominal Iron Pipe Size (inches)	Internal Diameter (inches)	Length of Pipe (Feet) 10	20	30	40	50	60	70	80	90	100	125	150	175	200.	
3/4	.824	278	190	152	130	115	105	96	90	84	79	72	64	59	55}	BTU'S
1	1.049	520	350	285	245	215	195	180	170	160	150	130	120	110	100}	PER
1 1/4	1.380	1,050	730	590	500	440	400	370	350	320	305	275	250	225	210}	HOUR
1 1/2	1.610	1,600	1,100	890	760	670	610	560	530	490	460	410	380	350	320}	X 1,000

It is recommended that a soapy solution be used to detect leaks. Bubbles will appear on the pipe to indicate a leak is present. The gas piping must be sized for the proper flow and length of pipe, to avoid pressure drop. Both the gas meter and the gas regulator must be properly sized for the total gas load. If you experience a pressure drop greater than 1" WC, the meter, regulator or gas line is undersized or in need of service. You can attach a manometer to the incoming gas drip leg, by

removing the cap and installing the manometer. The gas pressure must remain between 7" and 14" during stand-by (static) mode and while in operating (dynamic) mode. **If an in-line regulator is used, it must be a minimum of 10 feet from the Munchkin. It is very important that the gas line is properly purged by the gas supplier or utility. Failure to properly purge the lines or improper line sizing, will result in ignition failure.** This problem is especially noticeable in NEW LP installations and also in empty tank situations. This can also occur when a utility company shuts off service to an area to provide maintenance to their lines. This gas valve must not be replaced with a conventional gas valve under any circumstances. As an additional safety feature, this gas valve has a flanged connection to the Venturi and blower.

MUNCHKIN BURNERTECH GAS VALVE

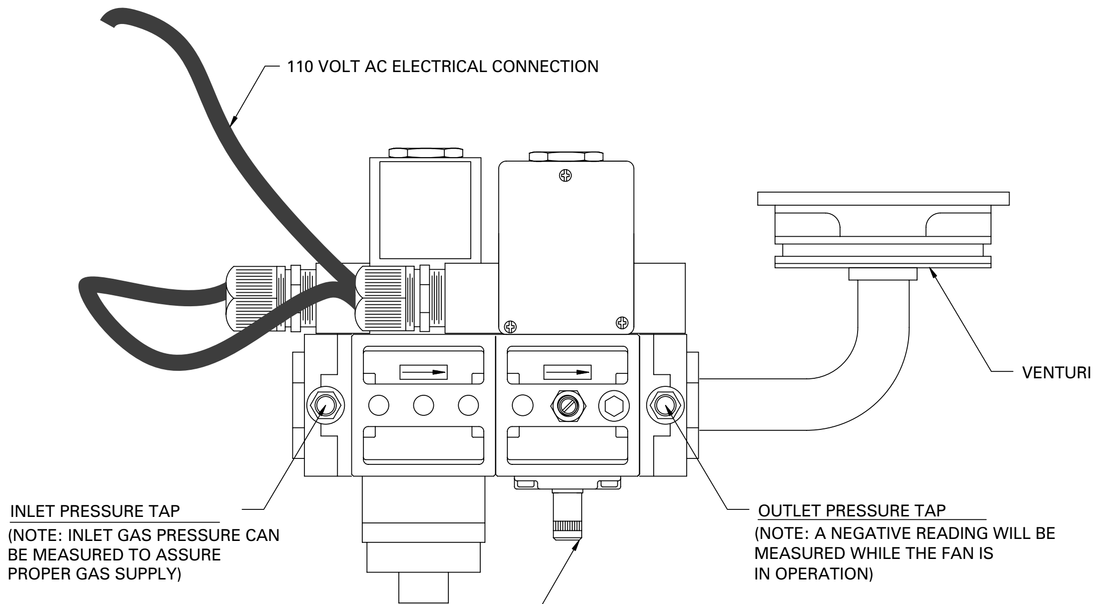


Fig. 3-1

⚠ WARNING

Failure to follow all precautions could result in fire, explosion or death!

COMBUSTION SETTINGS
HIGH FIRING RATES and LOW FIRING RATES ON ALL MODELS

	Natural Gas		Propane LP	
	low	high	low	high
Carbon CO ppm Monoxide	0–20 ppm	70 ppm–135 ppm	0–20 ppm	80–150 ppm
Carbon CO_2% Dioxide	8-1/2% – 9-1/2%	8-1/2% – 9-1/2%	9-1/2% – 10-1/2%	9-1/2% – 10-1/2%

Fig. 3-2

PART 4. VENTING

⚠ DANGER

It is extremely important to follow these venting instructions carefully. Failure to do so can cause severe personal injury, death or substantial property damage.

A. APPROVED VENTING MATERIALS

Exhaust Vent

Use Plastic 4" Pipe Schedule 40 or 80.

1. Non-Foam Core PVC Pipe
2. Non-Foam Core CPVC Pipe
3. Non-Foam Core ABS Pipe

Vent Piping must conform to following

1. **PVC** Non Foam Core Pipe (Polyvinyl Chloride) to ASTM D-1785 or D-1784 Class 12454-B, Formerly designated Type 1, Grade 1.

2. **CPVC** (Chlorinated Polyvinyl Chloride) Class 23447-B, Formerly designated Type IV, Grade 1 conforming to ASTM D-1784.

3. **ABS** (Acrylonitrile-Butadiene-Styrene) Class 3-2-2-2-2 conforming to ASTM D3965.

⚠ DANGER

Foam Core Pipe is not to be used in connecting the exhaust pipe.

The Munchkin is a direct vent appliance. The Munchkin is listed as a Category IV Condensing Appliance. (The Munchkin Venting is rated at Zero Clearance to combustibles.)

Note: For Concrete construction or to meet certain fire codes, exhaust and inlet piping at the wall penetration to the Munchkin must be CPVC Schedule 40 or 80 to meet local fire codes. The balance from the penetrated wall to the outside, may be PVC Schedule 40 or 80.

Inlet Air Vent

Use the same material as used for exhaust in either 4" or 6" Plastic Pipe. Cellular Foam Core Pipe may be used for the inlet only, **NEVER ON EXHAUST PIPING!**

⚠ WARNING

This vent system will operate with a positive pressure in the vent pipe. Do not connect vent connectors serving appliances by natural draft into any portion of mechanical draft systems operating under positive pressure.

B. VENTING THE MUNCHKIN IN 4" OR 6" PLASTIC PIPE

⚠ DANGER

It is extremely important to follow these venting instructions exactly. Failure to do so can cause severe personal injury, death or substantial property damage.

⚠ CAUTION

The following are code restrictions for the location of the flue gas vent terminal. Compliance to these requirements doesn't insure a satisfactory installation; good common sense must also be applied. It is important to make sure that exhaust gases are not recirculated into the inlet air of the Munchkin.

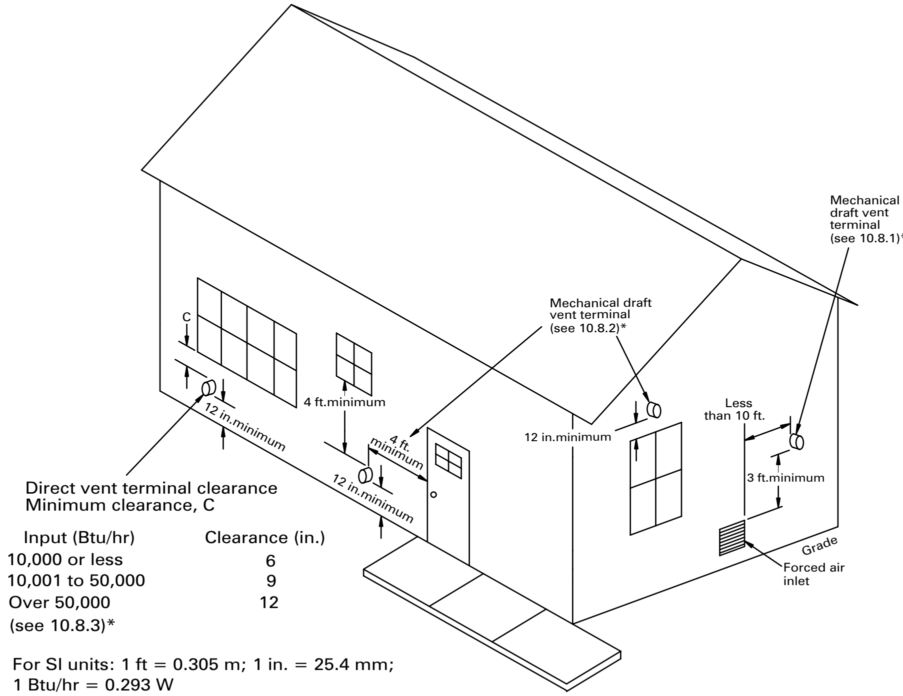
The inlet pipe on the back of the cabinet should be 4" PVC schedule 40. It is very important that you plan the location properly to eliminate long pipe runs and excessive fittings. Inlet pipe size must not be reduced. Do not combine the inlet air with any other inlet pipe including an inlet to an additional similar appliance. The joints must be properly cleaned, primed and cemented. The piping must also be properly supported as per Local and National Standard Plumbing Codes. It is important that the piping must be clean and free from burrs, debris, ragged ends and particles of PVC.

Exhaust piping should be sloped back to the connection on the Munchkin, at least ¼" per foot to remove additional condensate that forms within the pipe. The total combined length of pipe (intake piping plus exhaust piping added together) including elbow allowances intake and exhaust (each elbow = 5' of pipe) should not exceed 85'. The combined vent length should not be less than a combined length of 6' plus two 90 degree elbows. Choose your vent termination locations carefully. You must also make certain that exhaust gas does not re-circulate back into the intake pipe. You must place them in an open area and follow the following guidelines.

1) Never vent into a walkway, patio area, alley or otherwise public area less than 7' from the ground. (See detail below references Fig. A.10.8 in the National Fuel Gas Code 2002 "Exit Terminals of Mechanical Draft and Direct-Venting Systems".)
2) Never vent over or under a window or over a doorway where the exhaust plume or condensation liquid will cause obtrusive or dangerous conditions. (Or refer to National Fuel Gas Code, CAN B149)
3) Never install a heat saver or similar product to capture waste heat from exhaust.
4) Always have a vent location at least 1' above maximum snow level.
5) Always have vent 1' above ground level, away from shrubs and bushes.
6) Follow local gas codes in your region or refer to National Fuel Gas Code, Can B149.
7) Always have at least 3' from an inside corner of outside walls.
8) Maintain at least 4' clearance to electric, gas meters, windows, exhaust fans, chimneys, inlets or mechanical vents.
9) Very Important! The inlet air connection must be connected to outside air and should be located no closer than 8" to the exhaust and no further than 36".
10) Always place screens in all openings in intake and exhaust to prevent foreign matter from entering the Munchkin.
11) The vent intake and exhaust must be properly cleaned and glued for a pressure tight joint. Several methods for venting the Munchkin can be found in Figures 4-1 thru 4-4, this section. Use these layouts as guidelines: certain site conditions such as multiple roof lines/pitches may require venting modifications (consult factory). The air inlet must be a minimum of 1' vertically above the maximum snow level. It is very important that there are no other vents, chimneys or air inlets in any direction for at least 4'.

RECOMMENDED VENTING CLEARANCES PER THE NATIONAL FUEL GAS CODE*

***IMPORTANT NOTE**
HEAT TRANSFER PRODUCTS RECOMMENDS A MINIMUM CLEARANCE OF 4 FEET WHERE THE PLUME CAUSED BY THE UNIT MAY OBSTRUCT VIEWS OR AFFECT THE COSMETIC LOOK OF THE BUILDING.



EXIT TERMINALS OF MECHANICAL DRAFT AND DIRECT-VENT VENTING SYSTEM
* REFERENCE: THE NATIONAL FUEL GAS CODE 2002 EDITION

CAUTION

Flue Gas will condense as it exits the vent termination. This condensate can freeze on exterior building surfaces which may cause discoloration of these surfaces. Consideration should be given to the plume of condensation that exits the exhaust which may affect the cosmetic appearance of the building.

All venting must be properly supported. The Munchkin is not intended to support any venting whatsoever. All piping, glue, solvents, cleaners, fittings and components, must conform to ASTM (American Society for Testing and Materials), and ANSI (American National Standards Institute). It is recommended that you use one of the optional vent kits specifically designed for Munchkin installations, available from Heat Transfer Products, Inc.

Friction Loss Equivalent Table for 4" or 6" vent		
Fittings or Piping		**Equivalent Feet**
4" or 6" 90 degree elbow	=	5
4" or 6" 45 degree elbow	=	3
4" or 6" Coupling	=	0
4" or 6" air inlet tee	=	0
4" or 6" Plastic Pipe	=	1
4" or 6" V2000 vent kit	=	0

Example: Installation requires the following material for both inlet and exhaust piping for the Munchkin

Required: 4 Pcs. 4" 90 degree elbow (4 x 5 = 20 Equivalent Feet) = 20 Equivalent Feet
20' of 6" Plastic PVC Pipe (20 x 1 = 20 Equivalent Feet) = 20 Equivalent Feet

Total Friction Loss in Equivalent Feet (20 + 20 = 40 Equivalent Feet) = 40 Equivalent Feet

C. LONGER VENT RUNS USING A COMBINATION 4" TO 6" PIPE

CAUTION

Do not exceed the 85 foot maximum requirement for 4" PVC and the 125 foot maximum requirement for 6" PVC (intake plus exhaust piping added together) including fitting allowance shown in friction loss equivalent table on previous page.

CAUTION

Transitioning from 4" to 6" should be done in the Vertical position to avoid condensation blockage. If done in the horizontal position check to make sure condensation blockage will not occur.

The connection of air inlet and exhaust vent at the heater must remain 4" and each vent must extend from the heater a minimum of 15 equivalent feet before transitioning to a 6" vent. The overall extended maximum length of pipe on the inlet exhaust combined, must not exceed 125 equivalent feet. Listed below are the 4" and 6" size equivalent table.

Fittings or Piping		Equivalent Feet
4" or 6" 90 degree elbow	=	5
4" or 6" 45 degree elbow	=	3
4" or 6" Coupling	=	0
4" or 6" air inlet tee	=	0
4" or 6" Plastic Pipe	=	1
4" or 6" V2000 Vent Kit	=	0

Example: Installation requires the following material for both the inlet and exhaust piping when extending the vent run for the Munchkin.

Requirements for 4" Venting

2 Pcs. – 4" 90 degree elbow (2 x 5 = 10 Equivalent Feet) = 10 Equivalent Feet
20' of 4" Plastic PVC Pipe (20 x 1 = 20 Equivalent Feet) = 20 Equivalent Feet
Total of 4" Equivalent Piping with Fittings = 30 Equivalent Feet

Requirements for 6" Venting

6 Pcs. – 6" 90 degree elbows (6 x 5 = 30 Equivalent Feet) = 30 Equivalent Feet
4 Pcs. – 6" 45 degree elbows (4 x 3 = 12 Equivalent Feet) = 12 Equivalent Feet
40' of 6" Plastic PVC Pipe (40 x 1 = 40 Equivalent Feet) = 40 Equivalent Feet
Total of 6" Equivalent Piping with Fittings = 82 Equivalent Feet

Total Friction Loss in Equivalent Feet for both 4" and 6" (30 + 82 = 112 Equivalent Feet) = 112 Equivalent Feet

⚠ DANGER

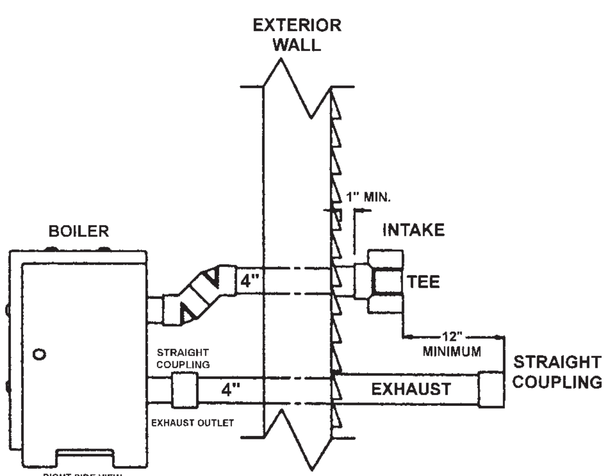
The Munchkin is not intended to be common vented with any other existing appliance!

D. HEATER REMOVAL FROM A COMMON VENT SYSTEM

At the time of removal of an existing heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to common venting system are not operating.

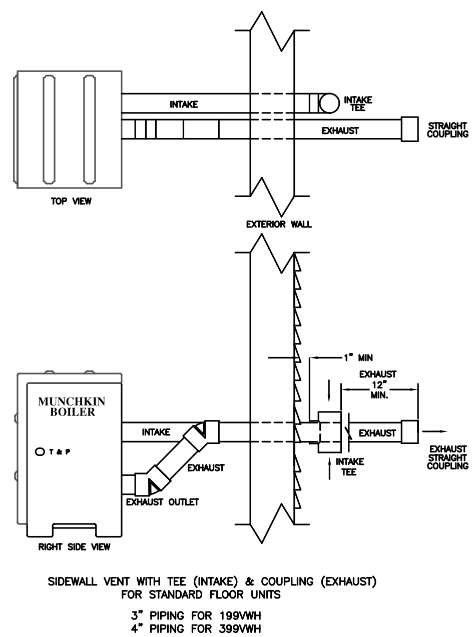
1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch to determine if there is blockage, leakage, corrosion or other deficiencies that could cause an unsafe condition.
3. If practical, close all building doors, windows and all doors between the space in which the appliance remains connected to the common venting system located and other spaces in the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, at maximum speed. Do not operate a summer exhaust fan. Close all fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust the thermostat so the appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle or smoke from a cigarette.
6. After it has been determined that each appliance remaining connected to common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code , ANSI Z 223.1

DIAGRAMS FOR SIDEWALL VENTING



**IMPORTANT NOTE: All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate).

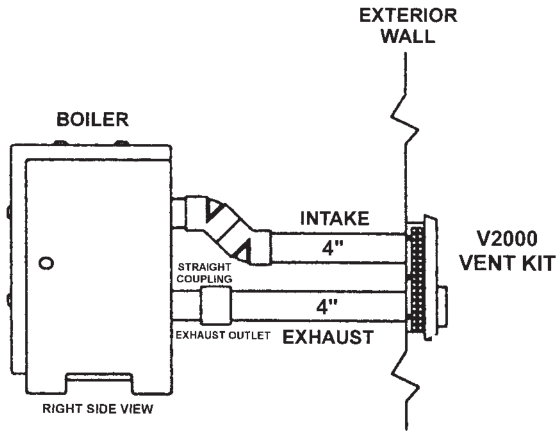
Figure 4-1: 4" Sidewall Vent with Tee (Intake) & Coupling (Exhaust)



**IMPORTANT NOTE: All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate). Always increase pipe in vertical position. Never increase pipe size in horizontal position.

Figure 4-2: 4" Sidewall Vent with Tee (Intake) & Coupling (Exhaust)

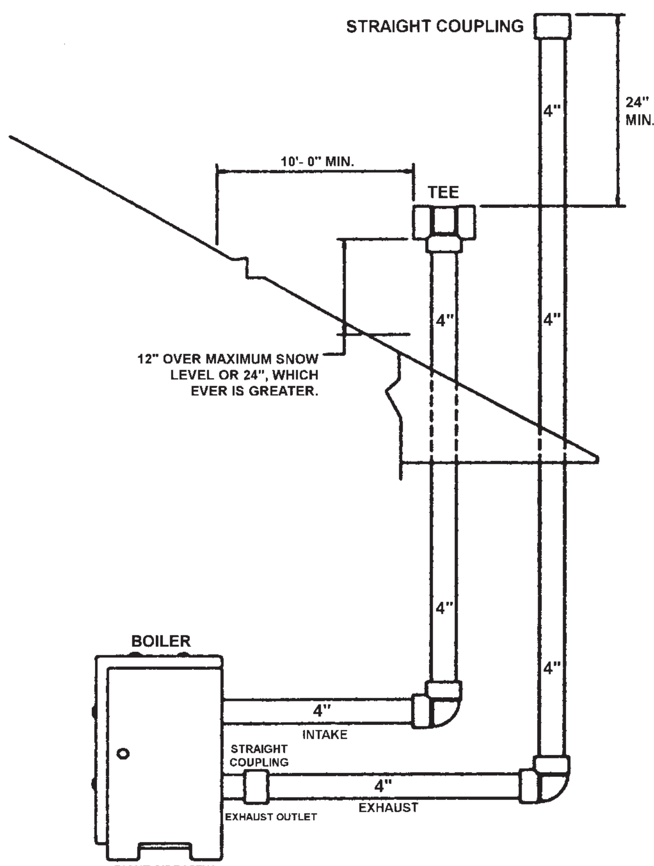
DIAGRAMS FOR SIDEWALL VENTING (cont'd)



**IMPORTANT NOTE: All vent pipes must be glued, properly supported and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate).

Figure 4-3: 4" Sidewall Vent with V2000 kit

DIAGRAM FOR VERTICAL VENTING



**IMPORTANT NOTE: All vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a ¼" per foot back to the heater (to allow drainage of condensate).

Figure 4-4: 4" Roof Vent with Tee (Intake) & Coupling (Exhaust)

E. CONDENSATE REQUIREMENTS

This is a condensing high efficiency appliance, therefore this unit has a condensate removal system. Condensate is nothing more than water vapor, derived from the combustion products, similar to an automobile when it is initially started. It is very important that the condensate line is sloped away from and down to a suitable inside drain, if the condensate outlet on the Munchkin is lower than the drain, you must use a condensate removal pump (kit available from Heat Transfer Products, Inc.) A condensate filter, if required by local authorities can be made up of lime crystals, marble or phosphate chips will neutralize the condensate. This can be done in the field by the installer or you may purchase one from Heat Transfer Products, Inc. It is also very important that the condensate line is not exposed to freezing temperatures, or any other type of blockage. Plastic tubing should be the only material used for the condensate line. Steel, brass, copper or others will be subject to corrosion or deterioration. A second vent may be necessary to prevent condensate line vacuum lock if a long horizontal run is used. Also, an increase in pipe size may be necessary to drain properly. Support of the condensation line may be necessary to avoid blockage of the condensate flow.

PART 5. PIPING

A. HYDRONIC PIPING WITH CIRCULATORS OR ZONE VALVES

The Munchkin is designed to function in a closed loop 15 PSI System. To assure you that you have adequate pressure in the system, we have installed in the outlet manifold, a pressure switch that will not let the Munchkin operate without a minimum of 10 PSI water pressure. This assures you that if the system does have leak, the Munchkin will lock out (PRO on the display) before it damages the Stainless Steel Heat Exchanger. We have also included a Temperature and Pressure gauge which should be located on the Munchkin outlet to monitor the system pressure and outlet temperature from the Munchkin. It is important to note that the Munchkin has a minimal amount of pressure drop and must be figured in when sizing the circulators. Each Munchkin installation must have an Air Elimination device which will remove air from the system. Install the Munchkin so the gas ignition system components are protected from water (dripping, spraying, etc.) during appliance operation for basic service of circulator replacement, valves and other. Observe minimum 1” clearance around all un-insulated hot water pipes when openings around pipes are not protected by non-combustible materials. On a Munchkin installed above radiation level, some states and local codes require a low water cut off device at the time of installation. If the Munchkin supplies hot water to heating coils in air handler units, flow control valves or other devices must be installed to prevent gravity circulation of heater water in the coils during the cooling cycle. Chilled Water Medium must be piped in parallel with the heater. Freeze Protection for new or existing systems must use glycol that is specially formulated for this purpose. It includes inhibitors, which prevent the glycol from attacking the metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level. The system should be tested at least once a year and as recommend by the producer of the glycol solution. Allowance should be made for the expansion of the glycol solution in the system piping. Example 50% by volume solution expands 4.8% in volume for the temperature increase from 32 F to 180 F, while water expands 3% with the same temperature rise.

⚠ CAUTION

The Munchkin should not be operated as a potable Hot Water Heater. It should not be used as a direct Hot Water Heating Device.

Basic steps are listed below, with Illustration, which will guide you through the installation of the Munchkin.

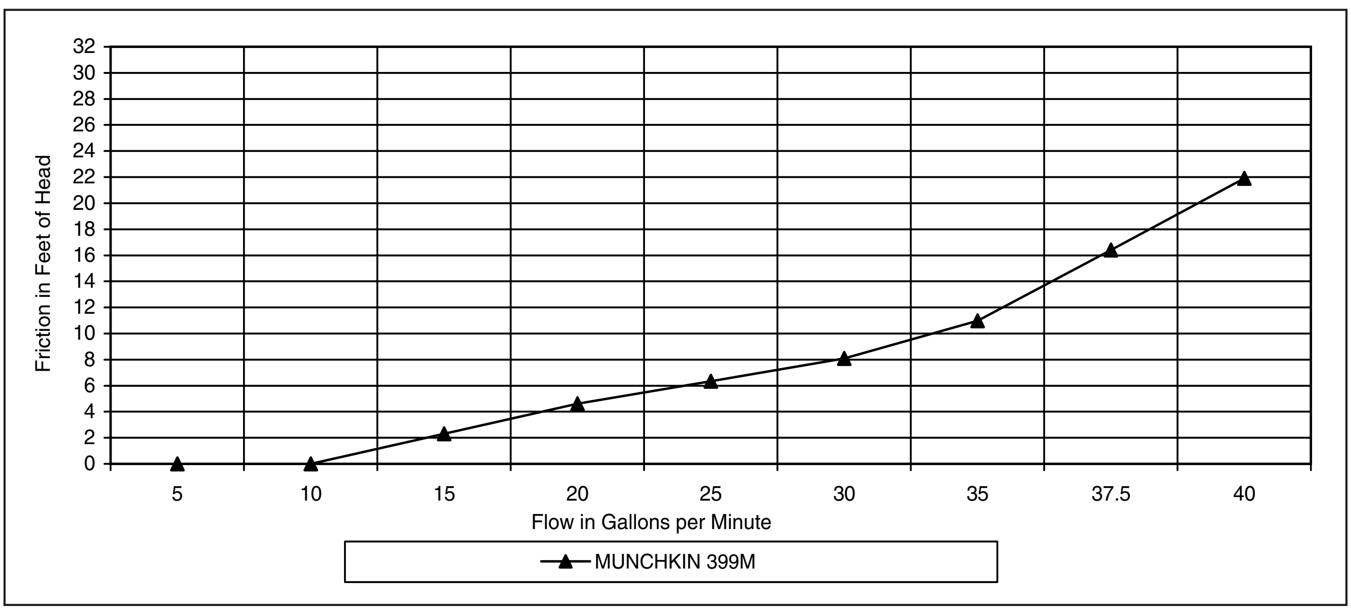
1. Connect the system return marked “Heater In”, make sure to install with pipe sealant com-

pound. Threaded connections are 2” NPT Brass nipples located on the left hand side of unit.
2. Connect the system supply marked “Heater Out”, make sure to install with pipe sealant compound. Threaded connections are 2” NPT Brass nipples located on the left hand side of the unit.
3. Install Purge and Balance Valve or shut off valve and drain on system return to purge air out of each zone.
4. Install a Back Flow preventor on the Cold Feed Make-Up Water line.
5. Install a Pressure Reducing Valve on the Cold Feed Make-Up Water line, (15 PSI nominal on the system return). Check Temperature and Pressure Gauge which should read minimum pressure of 12 PSI.
6. Install a circulator on system supply. Make sure the circulator is properly sized for the system and friction loss.
7. Install an Expansion Tank on the system supply. Consult the tank manufacturer’s instruction for specific information relating to tank installation. Size the expansion tank for the required system volume and capacity.
8. Install an Air Elimination Device on the system supply.
9. Install a drain valve at the lowest point of the system. Note: The Munchkin can not be drained completely of water without purging the unit with an air pressure 15 PSI.
10. The Safety Relief Valve is installed at the factory located on the right hand side of Munchkin. Pipe the discharge of safety relief valve to prevent injury in the event of pressure relief. Pipe the discharge to a drain. Provide piping that is the same size as the safety relief valve outlet. Never block the outlet of safety relief valve.

See the piping illustrations included in this section, Figs. 5-3 to 5-11 for suggested guidelines in piping the Munchkin heater with either zone valves or circulator pumps.
****Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.***

B. CIRCULATOR SIZING

The Munchkin Heat Exchanger does have pressure drop which must be considered in your system design. Refer to the graph below for pressure drop through the Munchkin Heat Exchanger.



Circulator Sizing Sizing Chart			
BOILER	TACO P/N	GRUNDFOS P/N	Bell & Gossett
399M	1400-50	UPS 32-160	PL-55

*THE RECOMMENDED CIRCULATORS ARE BASED ON 1 GPM PER 10,000 BTU/HR W/20

Figure 5-1

C. FILL AND PURGE HEATING SYSTEM

- **Attach the hose to balance and purge hose connector or drain valve and run hose to nearest drain**
- **Close the other side of the balance and purge valve or the shut off valve after the drain.**
- **Open first zone balance and purge or drain valve to let water flow out the hose. If zone valves are used, open the valves one at a time manually. (Note: please check valve manufacturer's instruction prior to opening valves manually, so as not to damage the valve.)**
- **Manually operate fill valve regulator. When water runs out of the hose, while it's connected to the balance and purge valve or drain you will see a steady stream or water (with no bubbles). Close balance and purge valve or drain to stop the water from flowing. Disconnect the hose and connect it to next zone to be purged.**
- **Repeat this procedure for additional zones (one at time).**

Upon completion, make sure that the fill valve is in automatic position and each zone balance and purge or shut off is in an open position and zone valves are positioned for automatic operation.

⚠ CAUTION

For installation that incorporates standing Iron Radiation and systems with manual vents at the high points. Follow above section and starting with the nearest manual air vent, open vent until water flows out, then close vent. Repeat procedure, working your way toward furthest air vent. It may be necessary to install a basket strainer in an older system where larger amounts of sediment may be present. Annual cleaning of the strainer may be necessary.

⚠ WARNING

Use only inhibited propylene glycol solutions which are specially formulated for hydronic systems. Ethylene glycol is toxic and can attack gaskets and seals used in hydronic systems.

1. Glycol in hydronic applications which is specially formulated for this purpose includes inhibitors which prevent the glycol from attacking metallic system components. Make certain that the system fluid is checked for the correct glycol concentration and inhibitor level.
2. The glycol solution should be tested at least once a year and as recommended by the glycol manufacturer.
3. Anti-freeze solutions expand more than water. For example a 50% by volume solution expands 4.8% in volume for a temperature increase from 32° F to 180° F, while water expands 3% with the same temperature rise. Allowances must be made for this expansion in the system design.
4. A 30% mixture of glycol will result in a BTU output loss of 15% with a 5% increase in head against system circulator.
5. A 50% mixture of glycol will result in a BTU output loss of 30% with a 50% increase in head against system circulator.

⚠ CAUTION

It is highly recommended that you carefully follow the glycol manufacturer's recommended concentrations, expansion requirements and maintenance recommendations (pH additive breakdown, inhibitor reduction, etc.). You must carefully figure the additional friction loss in the system as well as the reduction in heat transfer co-efficients.

D. PIPING ILLUSTRATIONS

Piping Symbol Legend

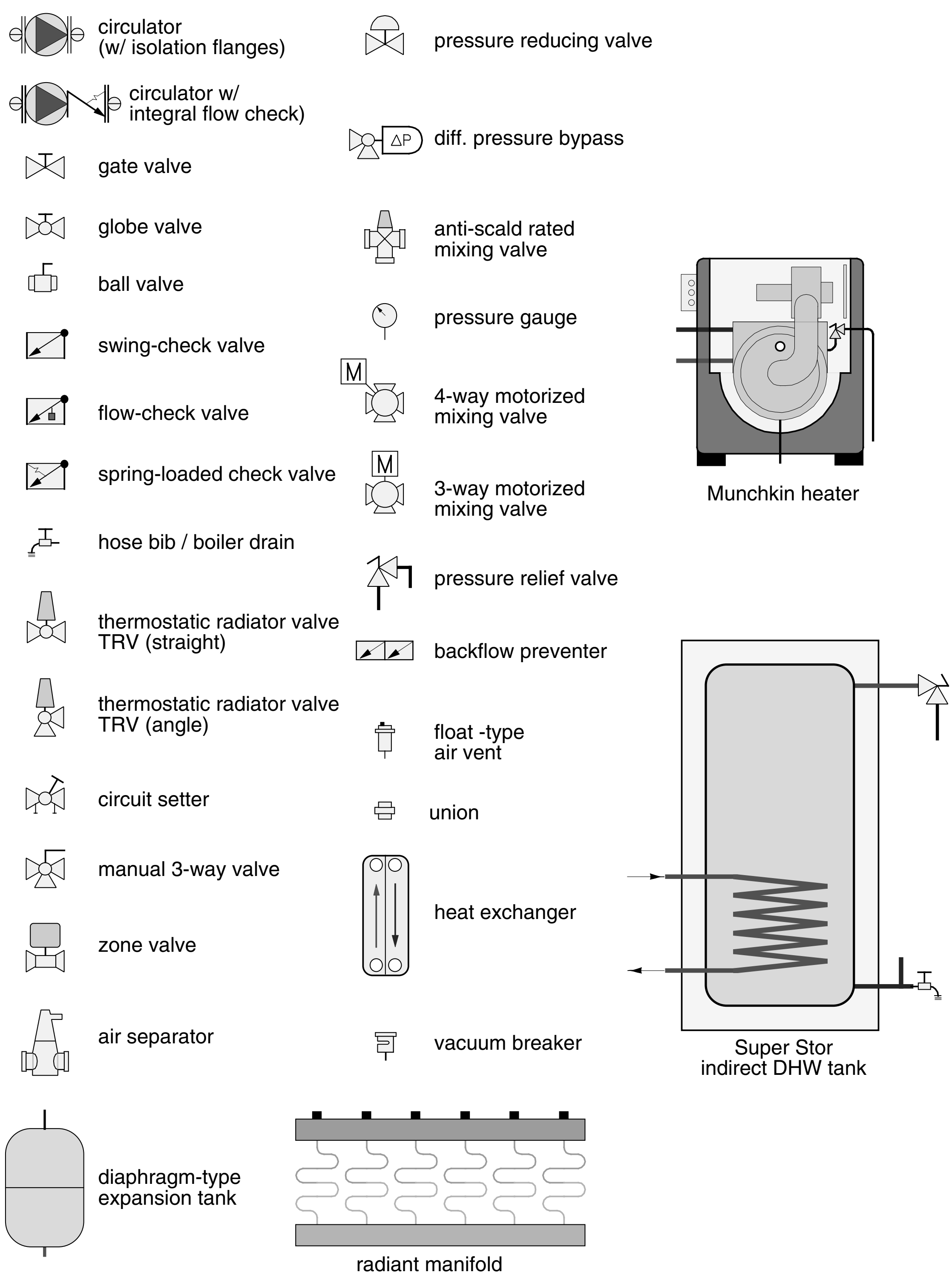
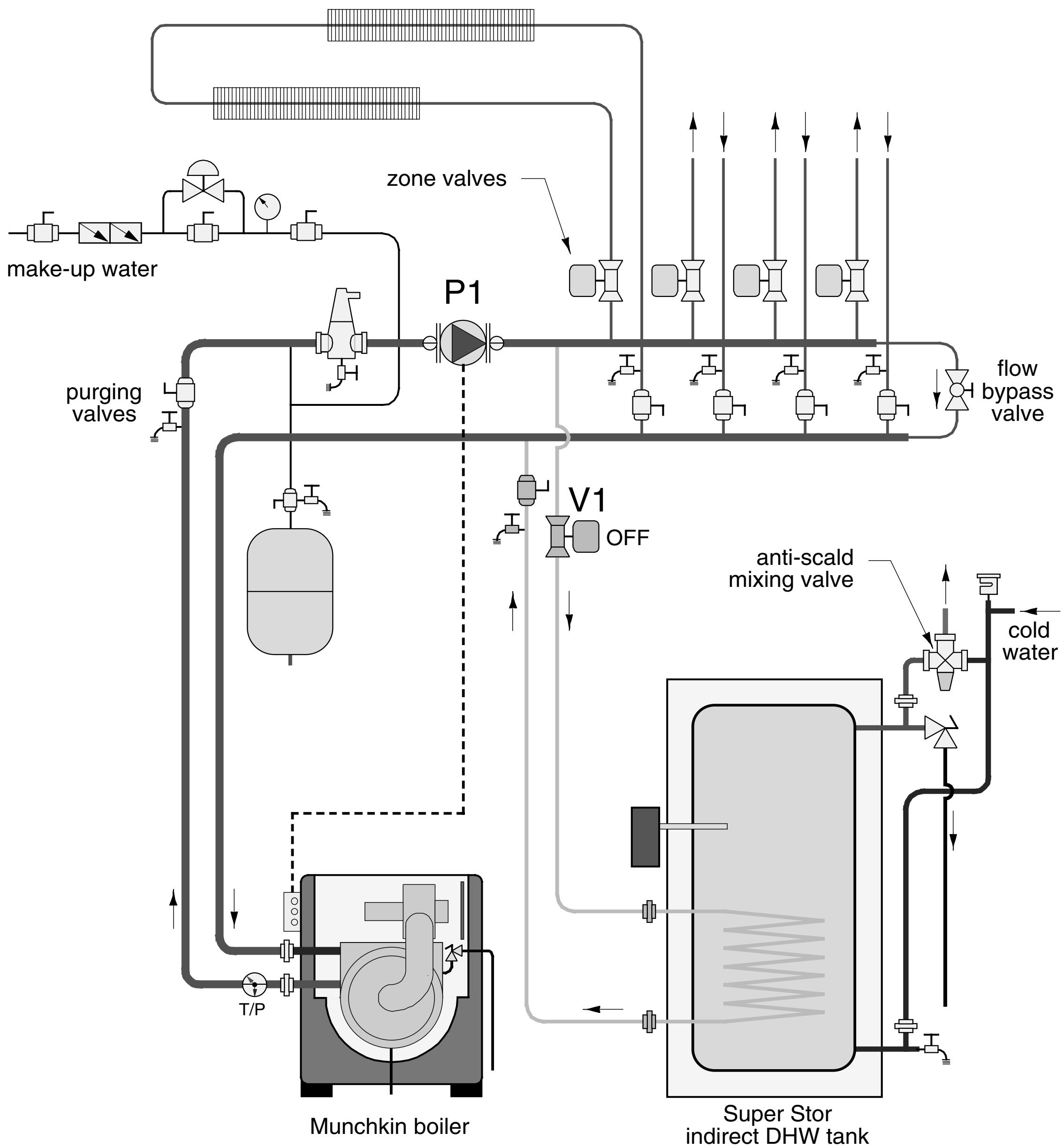


Fig. 5-2

Standard Munchkin boiler
Retrofit piping (zoning with valves)
Space heating mode

Drawing 1A



NOTES:

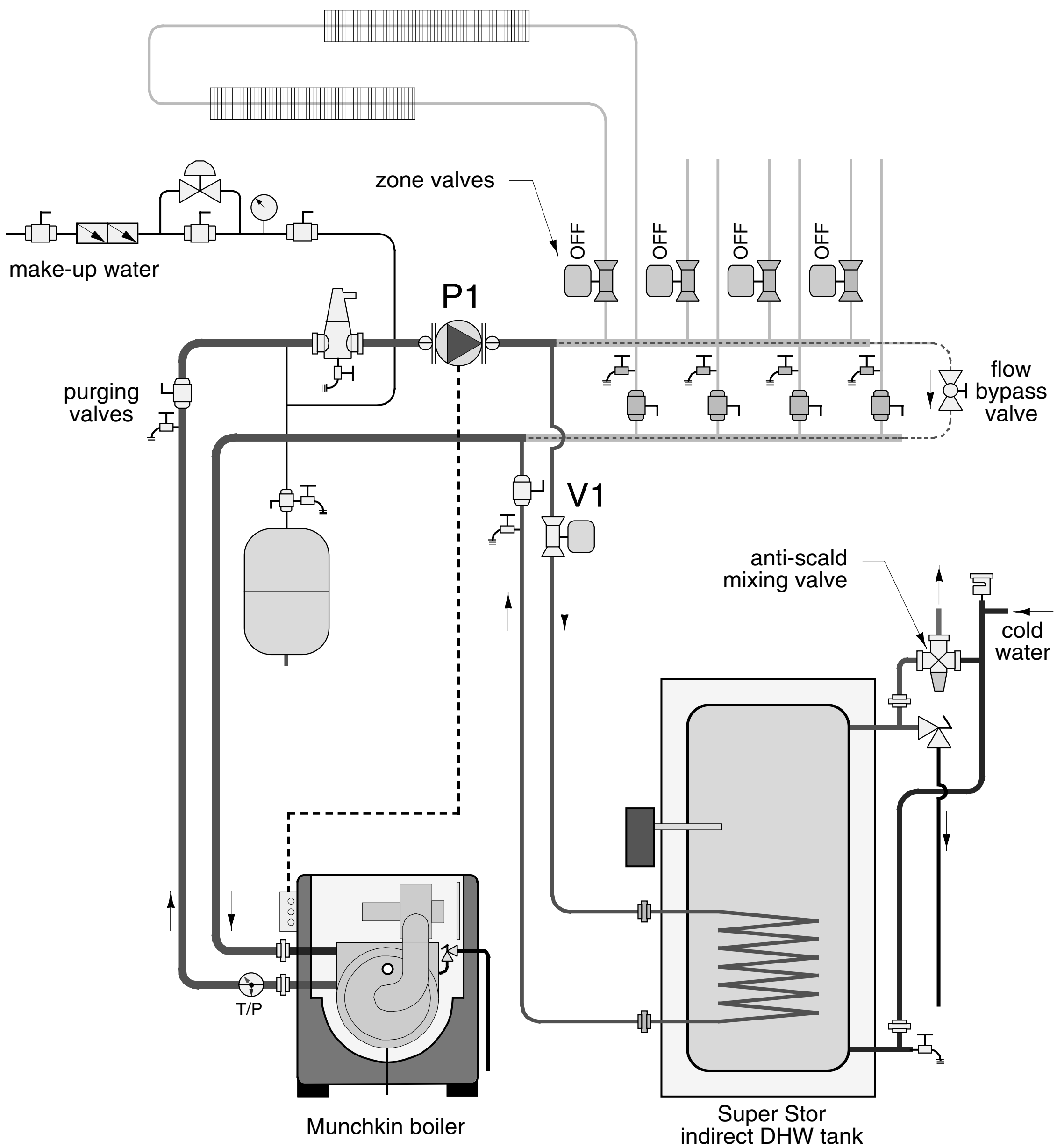
1. This drawing is meant to show system piping concept only.
   Installer is responsible for all equipment & detailing required by local codes.
2. Adjust flow bypass valve for the following minimum boiler flow rates in any operating mode:
   Munchkin model 399M: 16 gpm
3. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
4. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches.
5. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
6. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
8. A purging valve may be used in lieu of the ball valve / hose bib combination shown

Fig. 5-3

Standard Munchkin boiler Retrofit piping (zoning with valves)

Domestic water heating mode

Drawing 1B



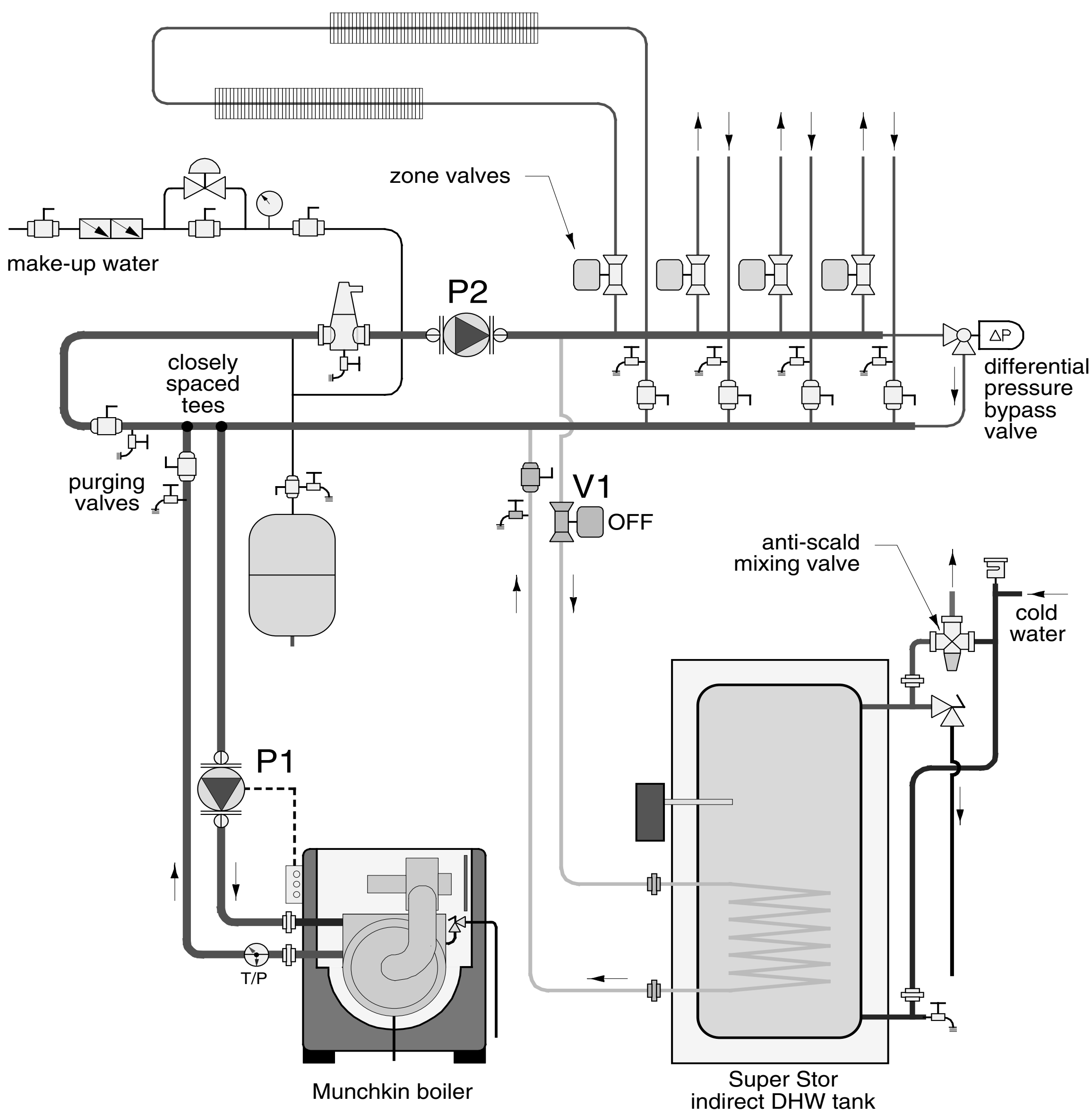
NOTES:

1. This drawing is meant to show system piping concept only.
   Installer is responsible for all equipment & detailing required by local codes.
2. Adjust flow bypass valve for the following minimum boiler flow rates in any operating mode:
   Munchkin model 399M: 16 gpm
3. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
4. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches.
5. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
6. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
8. A purging valve may be used in lieu of the ball valve / hose bib combination shown

Fig. 5-4

Standard Munchkin boiler
Preferred piping (zoning with valves)
Space heating mode

Drawing 2A



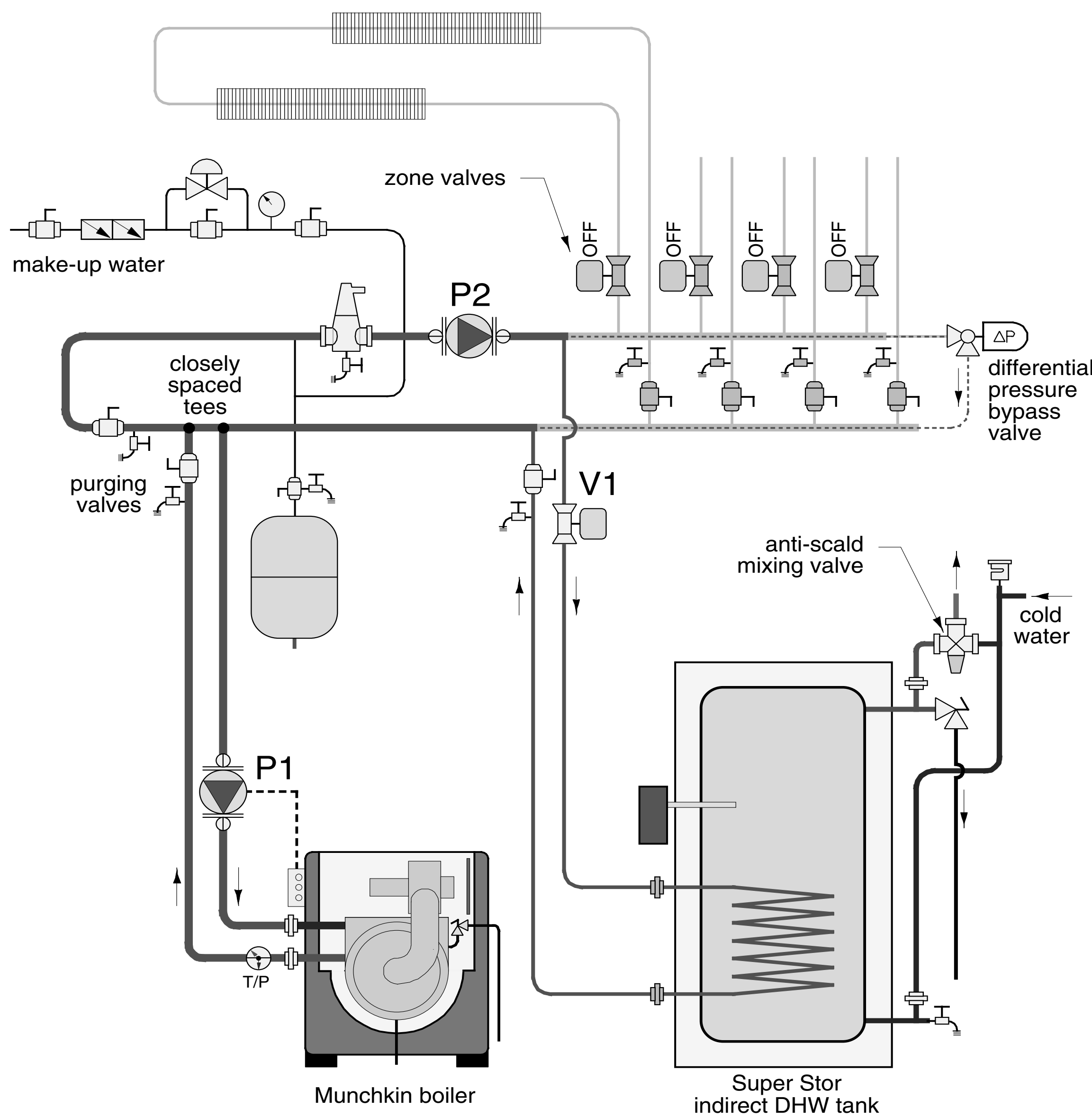
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Adjust differential pressure bypass valve to eliminate any flow velocity noise when zone with highest pressure drop operates by itself.
3. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
4. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches.
5. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
6. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
8. A purging valve may be used in lieu of the ball valve / hose bib combination shown.
9. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.

Fig. 5-5

Standard Munchkin boiler
Preferred piping (zoning with valves)
Domestic water heating mode

Drawing 2B



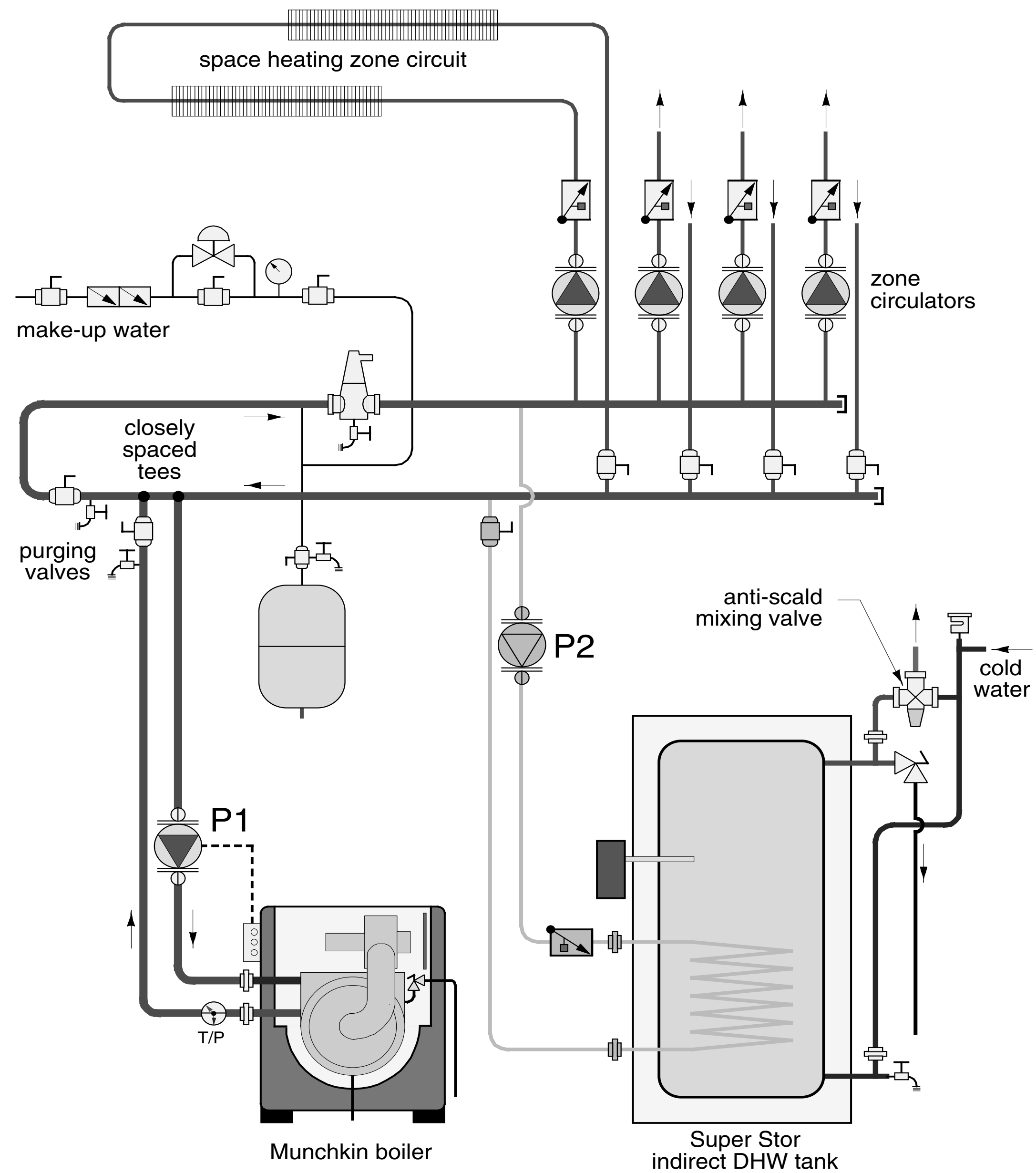
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. Adjust differential pressure bypass valve to eliminate any flow velocity noise when zone with highest pressure drop operates by itself.
3. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
4. The minimum pipe size for connecting a Munchkin boiler is 1.25 inches.
5. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
6. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
7. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
8. A purging valve may be used in lieu of the ball valve / hose bib combination shown.
9. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.

Fig. 5-6

Standard Munchkin boiler
Preferred piping (zoning with circulators)
Space heating mode

Drawing 2C



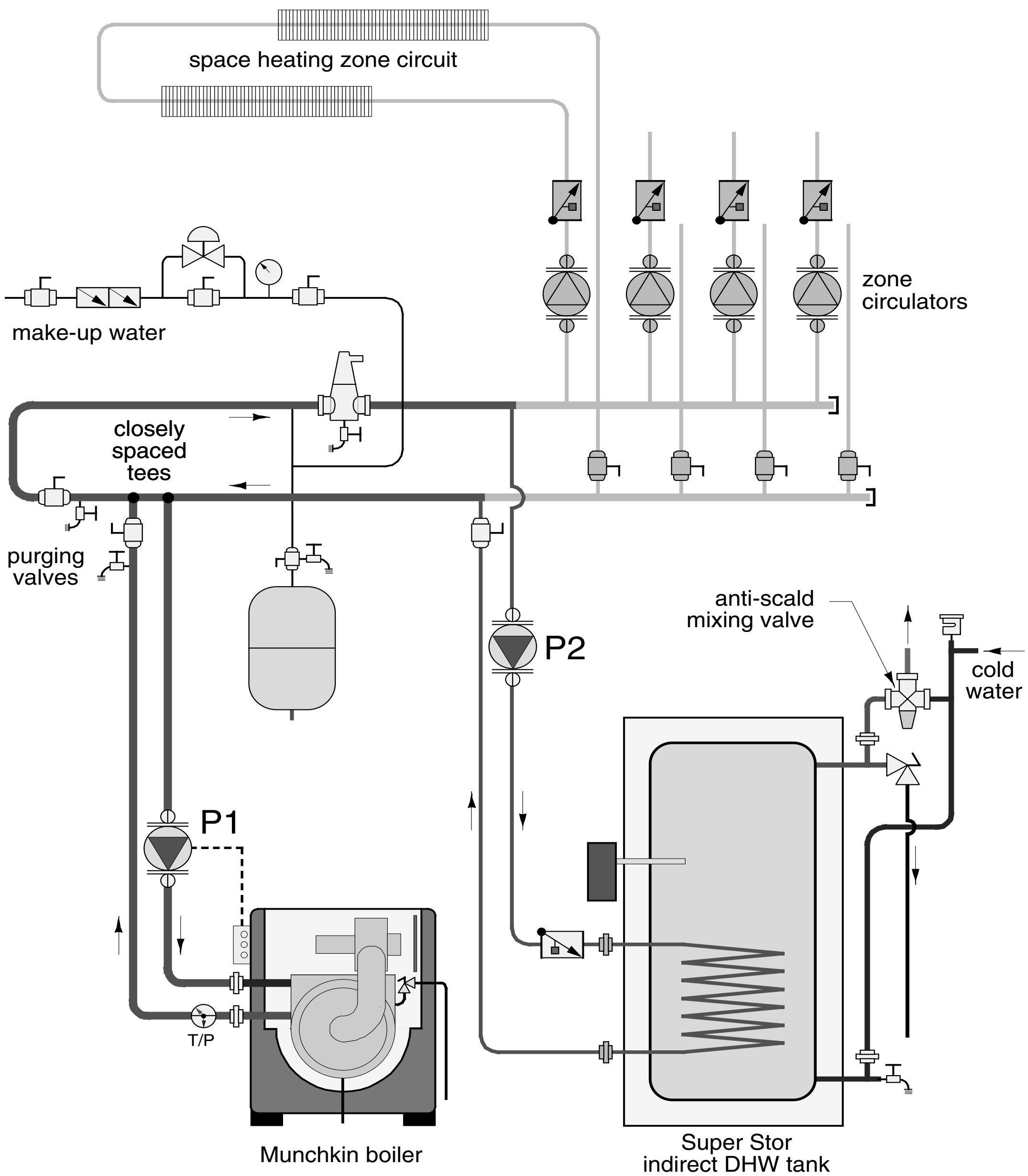
NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameter center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
5. The minimum pipe size for connecting a Munchkin boiler shall be 1.25 inches.
6. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. A purging valve may be used in lieu of the ball valve / hose bib combination shown.

Fig. 5-7

Standard Munchkin boiler
Preferred piping (zoning with circulators)
Domestic water heating mode

Drawing 2D



NOTES:

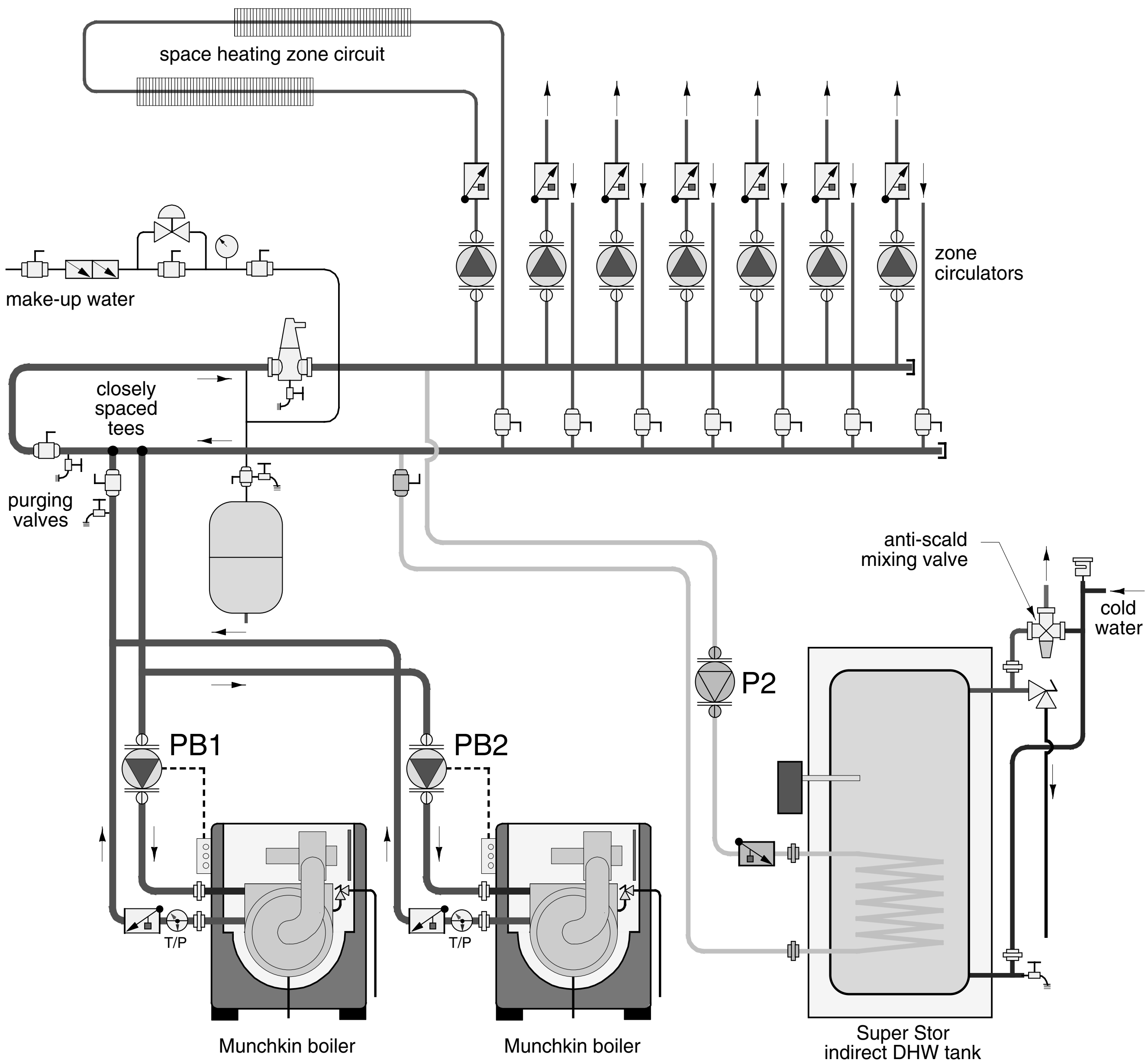
1. This drawing is meant to show system piping concept only.
   Installer is responsible for all equipment & detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameter center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
5. The minimum pipe size for connecting a Munchkin boiler shall be 1.25 inches.
6. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. A purging valve may be used in lieu of the ball valve / hose bib combination shown.

Fig. 5-8

Standard Munchkin boiler Preferred piping (multiple boilers / zoning with circulators)

Space heating mode

Drawing 2E



NOTES:

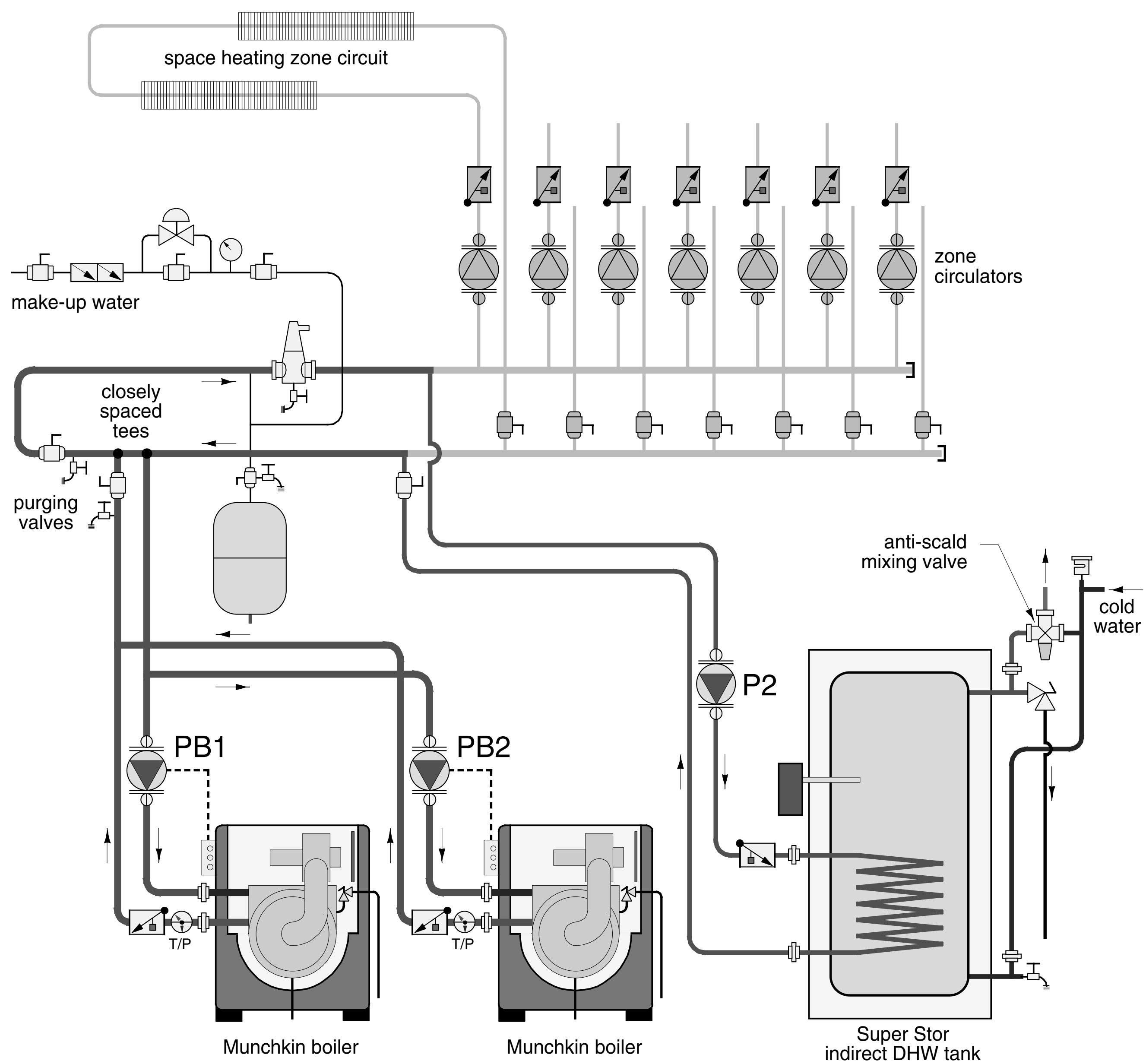
1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameter center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
5. The minimum pipe size for connecting a Munchkin boiler shall be 1.25 inches.
6. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. A purging valve may be used in lieu of the ball valve / hose bib combination shown.

Fig. 5-9

Standard Munchkin boiler Preferred piping (multiple boilers / zoning with circulators)

Domestic water heating mode

Drawing 2F



NOTES:

1. This drawing is meant to show system piping concept only. Installer is responsible for all equipment & detailing required by local codes.
2. All closely spaced tees shall be within 4 pipe diameter center to center spacing.
3. A minimum of 6 pipe diameters of straight pipe shall be installed upstream and downstream of all closely spaced tees.
4. The minimum pipe size for connecting a Super Stor water heater is 1 inch.
5. The minimum pipe size for connecting a Munchkin boiler shall be 1.25 inches.
6. All pumps are shown with isolation flanges. The alternative is standard flanges with full port ball valves.
7. The anti-scald mixing valve is recommended if the DHW temperature is set above the factory setting of 119˚F.
8. Install a minimum of 12 diameters of straight pipe upstream of all circulators.
9. A purging valve may be used in lieu of the ball valve / hose bib combination shown.

Fig. 5-10

PART 6. START-UP PROCEDURES

A. ITEMS TO BE CHECKED BEFORE LIGHTING THE MUNCHKIN

It is recommended that you read the General Information Section (Part 1) to get a better understanding how the Munchkin operates before you start the unit.

1. Make sure that you follow the Lighting instruction before running the Munchkin.
2. Make sure the unit has a minimum water supply pressure of 10 PSI or a fault code of PrO will appear in the display. While this Fault code is on the display the unit will not operate unit until the water pressure is brought above 10 PSI. This Fault code is caused by the Water pressure switch being open for more than 5 seconds which is an indication your system pressure is below 10 PSI. Increase the water pressure in the system until the pressure gauge reads 10psi. This code will disappear once the Water Pressure switch is closed, which will allow you to start the Munchkin.
3. Check to see if all the electrical connections are on securely. Also, make sure the clear plastic hose is connected to the outlet of the combustion blower outlet and connected back to the Air Switch.
4. Make sure that the Gas is turned on inside the cabinet and outside of the Munchkin.
5. Double check the temperature setting (Note: The Munchkin is factory set at 180 degrees)
6. Make sure the unit is properly grounded and the electrical wiring meets the requirements of the electrical section (Part 2).
7. Turn on the power to the Munchkin. The Temperature of the Munchkin Outlet will appear in the display provided. If a fault code appears, correct the fault before operating. Make sure that the room thermostat is connected and turn the room thermostat up above room temperature to start the combustion blower fan to run the Munchkin. The Munchkin will now run its pre-purge cycle, then begin running, which will be indicated by the Green light illuminating under “Flame On” in your display.

⚠ DANGER

If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury or loss of life.

B. LIGHTING INSTRUCTIONS

FOR YOUR OWN SAFETY READ BEFORE OPERATING

1. This appliance does not have pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
2. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

   WHAT TO DO IF YOU SMELL GAS
   - Do not try to light any appliance.
   - Do not touch any electric switch; do not use any phone in your building.
   - Immediately call your gas supplier from a neighbor's phone. Follow the gas suppliers' instructions.
   - If you cannot reach your gas supplier, call the fire department.
3. Turn on gas shutoff valve (located inside of the Heater) so that the handle is aligned with the gas pipe. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

4. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.
5. The Munchkin Heater shall be installed so the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement, etc.)

C. OPERATING INSTRUCTIONS

1. STOP! Read the safety information in Part 6.
2. Set the thermostat to the lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front cover.
6. Turn gas shutoff valve clockwise to “off”. The handle will be vertical, do not force it.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow Part 6, Section B/Lighting Instructions in the safety information. If you don't smell gas, go to the next step.
8. Turn the gas shutoff valve counter clockwise to “on”. The handle will be horizontal.
9. Replace the Front Cover.
10. Turn on all electric power to appliance.
11. Set the thermostat to the desired setting.
12. If the appliance will not operate, follow the instructions “To Turn Off Gas To Appliance” Section E and call your service technician or gas supplier.

D. ADJUSTING THE TEMPERATURE ON THE MUNCHKIN DISPLAY:

1. Before you can change the temperature from the factory setting of 180 degrees. You must make sure that none of the thermostats are calling for heat. The Munchkin controller will not memorize a program setting while in a heating cycle. To adjust the temperature to the Munchkin simply press in the S3/Program key for three seconds until you see a flashing <u>(C) then an alternate value of (180)</u>. This number is the factory set point of the unit, which is 180 degrees. To change the temperature, simply push either the S1/– or S2/+ on the display. The S1/– button will decrease the temperature while the S2/+ will increase the temperature of the Munchkin. The temperature of the Munchkin can be set as low as 50 Degrees and as high 203 Degrees. These ranges are your maximum and minimum ranges of the Munchkin. In addition to changing the temperature you are also allowed to change three more settings in this model (1. Munchkin differential – 2. Indirect setting **(Vision System Only)** – 3. Celsius to Farenheit measurement. Simply press in the S3/Program key to get to next value, the Munchkin differential setting will appear in the display <u>ch and alternating value of 30</u>. This allows the installer to adjust the activation of the burner based on the differential temperature setting of the Munchkin. The burner will not start until the outlet water temperature reaches a temperature that is equal to the temperature setting for the Munchkin, minus the differential EX: The Munchkin is set to heat at 180° F degrees and the differential is set at 20° F. The burner will not start until the outlet temperature of the system falls below 159° F degrees (180° – 20° F = 160° F). To adjust, press either S1/– (Decrease Value) or S2/+ (Increase Value) Ranges 5° F to 30° F. Press the S3/Program key again and you will see the Indirect Setting <u>de and an alternative value of 119</u> **(Vision Systems Only)** To adjust, press either S1/– (Decrease Value) or S2/+ (Increase Value).

The final adjustment in this mode is the Farenheit to Celcius measurement. Press the S3/Program key again and you will see <u>t and alternating value of F</u>. To change value press the S1/– or S2/+ to choose the correct measurement.

E. STATUS MENU

Installers are also able to check the current status of the Munchkin parameters by pressing S4/RESET key for 3 seconds. Once activated, the display will show d1 alternating value of the actual outlet temperature. Actual values are displayed for each function. To view the next value simply press the S/4 key to go to the next displayed value. Listed below are the values which can be displayed. These values cannot be changed. To exit this menu, simply press S3/Program key to resume normal operation.

Function	Value
d1/	Actual Temperature from outlet sensor
d2/	Actual Temperature from inlet sensor
d3/	If using a standard mechanical control, the control will display 1 for closed 0 for open If the sensor is connected to the SuperStor Indirect Fired Water Heater it will measure the actual temperature. (Vision only.)
d4/	Not used
d5/	Actual Temperature from the outdoor sensor. (Vision only.)
d6/	Actual Fan speed multiplied by 10 (Example: If fan speed displayed is 410 RPM x 10 = 4100 actual fan speed)
d7/	Actual Ionization current read from Flame Rectification probe
d8/	Actual Status of the Central Heating Circulator Off = 0 , On = 1 . (Vision only.)
d9/	Actual Status of the Indirect Fired Circulator Off = 0 , On = 1 . (Vision only.)
d10/	Actual Status bus communication co = connected, no = not connected
d11/	Central Heating Set Point

F. TEST MODE

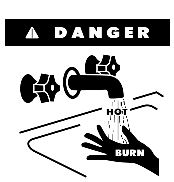
This function is intended to simplify the gas valve adjustment if needed. Listed below are the recommended limits on each Munchkin Heater and the Combustion Settings **(Part 3: Gas Connections)**. Automatic modulation does not take place when the controller is in Test mode, only temperature limitation based on the Munchkin Central Heating set point. The user will be allowed to increase or decrease the fan speed by pressing in either the S1/- or S2/+ keys.

To activate the Test mode simply press the S2/+ and S3/Program key together for 1 second. Once activated, you will see in the display Ser and the actual fan speed. The measurement of the combustion levels should always be taken at the highest and lowest fan speed. After 10 minutes, the Test mode stops automatically. To exit Test Mode press S1/- and S2/+ key together for 1 second.

G. TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove the front cover.
4. Turn gas shutoff valve clockwise to "off". Handle will be vertical. Do not force.
5. Install front cover.

⚠ DANGER



Water temperature over 125 degrees F. can cause severe burns instantly, or death from scalds. Children, disabled, and elderly are at highest risk of being scalded. See instruction manual before setting temperature at water heater. Feel water before bathing or showering! Temperature limiting valves are available.



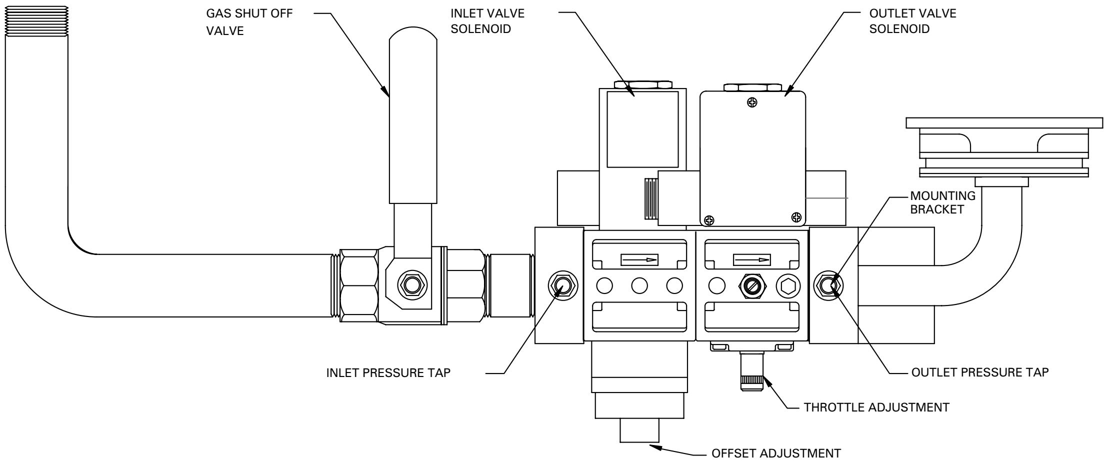


Fig. 6-1

PART 7. SERVICING

A. SEQUENCE OF OPERATION

1. When power is first applied to the control, the control display will read the outlet temperature. The control will initially run through a self-diagnostic routine and then go into its operating mode. If there is no call for heat, the System will go into an idle state.
2. If the thermostat is calling for heat, the control will apply power to the circulator pump. If the control determines the water temperature is below the programmed set point value minus the switching differential, the control will initiate a heating cycle.
3. The control then performs selected system diagnostic checks. If all checks are successfully passed, a pre-purge cycle is initiated (the blower will be on maximum speed).
4. When the pre-purge period is complete, power is applied to the spark ignitor for approximately 6 seconds. Approximately 2 seconds later, we verify flame. If a flame is not verified during the trial-for-ignition, the gas valve is immediately closed and the control will return to step. After three trials, if a flame is not verified, the control will go into a lockout mode. If a flame is confirmed, the control enters the heating mode. The fire rate will be based on the proprietary algorithm.
5. When water temperature reaches the temperature set point value plus 10 degrees F (or if the thermostat call-for-heat is satisfied), the gas valve is closed and the control enters a post-purge state (the blower will be on maximum speed). **NOTE: If the thermostat is still calling for heat, the circulator pump will continue to run until the thermostat call for heat is satisfied.**
6. When the post-purge is complete, the control enters an idle state while continuing to monitor temperature and the state of other system devices. If a call-for-heat is received, the control will automatically return to step 2 in sequence and repeat the entire operating cycle.

During the idle state and heat state, if the control detects an improper operating state from external devices, such as the high-limit switch, the red light on the control will illuminate an error code will appear in the display.

B. MUNCHKIN TEMPORARY FAULT CONDITION

A Temporary Fault Condition may occur in the installation of the Munchkin. This condition may lead to a lock out condition of the controller, which will need to be manually reset through the S4/Reset button. These temporary codes will help the installer correct the problem before going into a lock out condition, which will require a manual reset. Example: A temporary fault-code of E15 indicates that the Air Pressure Switch is open when the fan is in the pre-purge function, when it should be

closed. This could occur if the clear hose, which is connected to the outlet of the fan is disconnected. This can be corrected by re-connecting the hose. Listed below are the Temporary Fault Codes.

E00 This code will appear if there is an overshoot of the high limit. The Temporary Fault Code will be displayed only 50 seconds.

E13 This code will appear if the expected fan speed is lower then 70%. This will show on the display 10 seconds after the fan has started. The Temporary Fault code will only be displayed an additional 50 seconds before going into lock out mode (F13).

***Remedy* – Check wiring to assure that the Fan is connected correctly.**

E14 This code will appear if the expected fan speed is higher then 130%. This will show on the display 10 seconds after fan is started. The Temporary Fault Code will only be displayed an additional 50 seconds before going into lock mode (F14).

***Remedy* – Check wiring to assure that the Fan is connected correctly.**

PR0 This code will appear if the Water Pressure Switch is open for more than 5 seconds. The unit will not be allowed to operate while this code is on the display.

***Remedy* – Check the water pressure in the system. Make sure the pressure is at least 10 PSI. Check all electrical connections to the switch. If the switch still does not close, try adjusting the switch with a screw driver and turn screw in center of the switch counter-clockwise to close switch. If the switch still does not close with a minimum supply pressure of 10 PSI, then replace the switch.**

C. MUNCHKIN FAULT REQUIRING MANUAL RESET

When a fault condition occurs or is sensed on the Munchkin controller or in the appliance, the controller goes into a lockout state. When in LOCKOUT state, the red led light will illuminate and a fault code will be presented in the display. To reset the lockout condition, simply push the S4/Reset to bring the control out of its lockout state. If the problem is not corrected, the Munchkin will repeat the fault until the condition is corrected. Once corrected, the display will resume its supply temperature setting. Listed below are the Fault Codes and the remedies to correct the fault.

F00 **Safety Limit ECO** – This code appears if the Safety Limit ECO opens. The ECO will normally open if it senses a temperature greater than 225 degrees.

***Remedy* – Let the unit cool down and push the reset button (S4). Determine if there is water flow through the heater. Manually reset the unit by pushing the S4/reset button. If the lockout continues, replace the switch to correct the problem.**

F01 **Safety Limit Flue** – This code appears if the Safety Limit Flue senses a temperature higher than 210 degrees.

Remedy – Push the red button down on the Flue sensor, then push the reset button on the display. If you experience another F01 lock out code, replace the flue sensor, then try again. Check to see that condensation line is not frozen. Manually reset by pushing the S4/reset button. If this problem persists, call factory for further assistance.

F02 **Interrupted or Shorted Supply Thermister** – This code appears if the Supply thermister located on the Munchkin Outlet manifold has been interrupted or shorted.

Remedy – Check the wiring connection and connectors on the thermister. If the unit locks out again, replace the Supply Thermister. Manually reset the unit by pushing the S4/reset button

F03 **Interrupted or Shorted Return Thermister** – This code appears if the Return thermister located on the Munchkin Outlet manifold has been Interrupted or shorted.

Remedy – Check the wiring connection and connectors on the thermister. If the connection is okay, hit reset S4/Reset. If the unit locks out again, replace the Return Thermister.

F05 **Supply Temperature is to High** – This code appears if the Supply temperature sensor goes above 230 degrees.

Remedy **– Let the Munchkin cool down, then manually push the reset button and see if the temperature increases to above 230 degrees. Determine if you have water flow or if the thermostat is continuously energized and correct the problem. Manually reset by pushing the S4/reset button.**

F06 **Return temperature is too High** – This code comes if the return water temperature goes above 230 degrees,

Remedy **– Let the Munchkin cool down then manually push the reset button and see if the temperature on the return increases to above 230 degrees. Check piping and determine the source of over heating and correct the problem. Manually reset by pushing the S4/reset button.**

F09 **This code will occur if the Munchkin control does not detect a flame.** The Munchkin will make three attempts for ignition before the control will go into a lockout condition. The Munchkin control will try to re-ignite after one hour and continue to try to ignite every hour.

Remedy **– Check the Flame Rod, Spark electrode or Hot Surface Igniter to see if they are in good condition, then clean it with abrasive paper and re-ignite. Also, check spark gap of ¼" on the spark electrode. If the Hot Surface igniter has any visible cracks, then replace it with a new Hot Surface Igniter. Check any flue blockage and condensate blocks. Also, check the Gas supply (Check Part 3, Table 1 [pg. 9] for pipe sizes and gas pressure settings) and correct problem if it is out of specification. The cleaning of the rectifier is recommended to provide a more consistent signal to the control. Manually reset by pushing the S4/reset button.**

F10 **This code appears if the flame is going out while the burner is on and this happens more then 4 times in one heat demand.**

Remedy **– Check to see if the green light on your display is out while the unit is running. If the green light on the display either does not come on or goes out while running, read the flame rod with a voltage meter to read the flame current. If it's less than 1 micro-amp, change or clean the flame rod. Also, check the Gas pressure while the unit is running to determine if pressure is adequate. See Part 3, Gas Connection. If the gas pressure is too low, correct the problem. Manually reset by pushing the S4/reset button.**

F11 **The flame detector circuit is seeing a flame signal while no flame is present.**

Remedy **– Check the wiring to the Gas Valve. Check the flame rod and make sure it's clean, then manually reset S4/Reset button. If a lockout occurs, replace the board.**

F13 **Combustion fan running too slow.** The speed detected of the hall pulse signal is less than 70% of the desired fan speed for longer then 1 minute.

Remedy **– Check the Fan wiring. Manually reset by pushing the S4/reset button.**

F14 **The speed detected of the hall pulse is more then 130% of the desired fan speed for longer then 1 minute when the fan should be on.** If the fan should be off and the speed detected of the hall pulse output is more then 1500rpm and longer then 1 minute, this code will appear.

Remedy **– Check Fan Wiring. Manually reset by pushing the S4/reset button.**

F18 **Gas Valve not correctly connected/internal fault.** Just before ignition, a test is performed on the gas connection. If there is a failure in the gas valve connection and or the valve is not connected, this fault code will appear.

Remedy **– Check the connection to gas valve. Check the wiring to the board. If the problem persists, change gas valve cable. Manually reset by pushing the S4/reset.**

F30 **Watchdog.** Call Factory for further assistance.
Remedy **– Call Factory for further assistance**

F31 **Parameter Memory.** External Parameter memory corrupted
Remedy **– Call Factory for further assistance**

F32 **Parameter memory write error.** External Parameter memory fault
Remedy **– Call Factory for further assistance**

F33 **Programming Error.** Programming with PC not successful
Remedy **– Call Factory for further assistance**

RESISTANCE TABLES

Boiler & Indirect Temperature (˚F)	Resistance (ohms)
32	32550
41	25340
50	19870
59	15700
68	12490
77	10000
86	8059
95	6535
104	5330
113	4372
122	3605
131	2989
140	2490
149	2084
158	1753
167	1481
176	1256
185	1070
194	915
203	786
212	667

PART 8. MAINTENANCE

A. MAINTENANCE PROCEDURES

Periodic maintenance should be performed once a year by a qualified service technician to assure that all the equipment is in safe efficient operation. The owner can make necessary arrangements with a qualified heating contractor for periodic maintenance of the heater. Installer must also inform the owner that the lack of proper care and maintenance of the heater may result in a hazardous condition. The installer should discuss the contents of the User's Information Manual with the owner.

B. BEFORE EACH HEATING SEASON:

A trained and qualified service technician should perform the inspections listed below at least once a year.

- **Heater –** check the heater for dust or foreign materials, which may have been drawn in from the air intake of the heater. Simply blow out or wipe down with a dry rag.
- **Vent Termination –** check to remove any obstructions, such as leaves, bushes, or other sources which may interfere with the units ability to draw fresh air on the air intake or exhaust flue gas from the exhaust outlet.
- **Vent Piping –** make sure that all vent piping is in good condition. Check Joints for possible leaks.
- **Condensate –** check the Condensate trap by simply starting the unit and observing the flow of Condensate which should not be restricted in any fashion. (See instructions below.)
- **Heat Exchanger –** in the unlikely event the heater flue passage is becoming blocked, service must be performed only by an authorized Heat Transfer Products Representative or Certified Installing Contractor. (See coil cleaning instructions pg. 39 Section D)
- **Burner –** check burner for deterioration. If deterioration is observed, replace burner.
- **System Water / Pressure –** check pressure regulator and system pressure. Check system for air which will create noise. Open air vents or purge system to bleed air then close once air is fully purged from the system.
- **Water Piping –** check for and repair any leaks.
- **Gas Piping –** check for and repair any leaks.

C. CONDENSATE CLEANING INSTRUCTIONS

1. Turn down the thermostat so the Munchkin will not cycle and then follow the steps below.
   a. Close gas valve
   b. Disconnect the condensate hose from the **outside** connection **(not from the Munchkin)** so flow can be observed.
   c. Block the air flow in the exhaust by temporarily plugging the exhaust from the outside vent.
   d. Disconnect the two gray wires (TT) from the incoming thermostat wires inside the electrical enclosure. Connect the two gray wires (TT) together from the Munchkin control panel. This will cause the fan to run at 100%, which will then blow out any sediment that has accumulated in the condensate line. (This process should only take a few minutes.)
   e. The unit should now be ready to re-start.
2. <u>Before re-starting the Munchkin follow the steps below:</u>
   a. Reconnect the Molex connection and un-block the vent (**IMPORTANT: MAKE SURE EXHAUST VENT IS NO LONGER BLOCKED!)**
   b. Open the gas valve, re-connect gray wires (TT) back to thermostat and turn up the thermostats.
   c. Observe the boiler function to make sure you see a condensate flow.
   d. If you do not observe a condensate flow, repeat the above procedure.
3. If the problem is not corrected at this point, it is possible you have a material deposit problem,

in which case, a qualified plumber will need to be contacted to follow the Coil Cleaning Instructions (Section D) included in this section to dissolve deposit and clean condensate line.

⚠ DANGER

IT IS EXTREMELY IMPORTANT TO MAKE SURE THE EXHAUST VENT IS NO LONGER BLOCKED. FAILURE TO DO SO MAY RESULT IN PERSONAL INJURY OR DEATH.

D. COMBUSTION CHAMBER COIL CLEANING INSTRUCTIONS*

*Before beginning this procedure, you must have on hand the following items:

- a nylon, stainless or brass brush (not steel)
- "Rydlyme" (recommended for best results) (available on line www.rydlyme.com) or "CLR" (available at most hardware stores)

1. Shut down the Munchkin by using the following steps:
   a. Close the gas valve, shut down the unit and wait for the unit to be cool to the touch
   b. Disconnect the condensate hose from the **outside** connection, **(not from the Munchkin side)**, so the flow can be observed.
   c. Remove screws and loosen bracket holding gas valve in place.
   d. Pull connector to the venturi by sliding gas valve to left, remembering to disconnect both Molex connectors.
   e. Remove the (6) 10MM nuts from the burner plate assembly to access the coils.
   f. Pull the entire burner plate assembly towards you, while removing or pushing aside any wiring to allow the removal of the assembly.
2. Using a spray bottle filled with the recommeded product "MARSOLVE" or "CLR", spray liberally on the coils, making sure the solution penetrates and funnels down through the condensate hose. If the condensate hose is blocked, let the chemical penetrate for at least 15 minutes or until it drains.
3. Use the nylon, stainless or brass brush (do not use steel) and scrub coils to remove any buildup, then vacuum the debris from the coils.
4. Spray the coils with clear water, making sure to confine the spray to the area being cleaned (Try to avoid getting the back cermic wall of the unit wet). Flush the combustion chamber with fresh water. At this point, the Munchkin should be ready to power back up.

Before powering up the Munchkin follow the steps below

a. Re-install the burner assembly
b. Replace the (6) 10MM nuts to the burner plate
c. Re-connect the Molex connectors
d. Re-connect gas valve, air-gas mixer and replace bracket. **(IMPORTANT: CHECK FOR GAS LEAKS)**
e. Re-set thermostats **(IMPORTANT: MAKE SURE EXHAUST VENT IS NO LONGER BLOCKED!)**
f. Turn the Munchkin back on** and observe condensate flow.

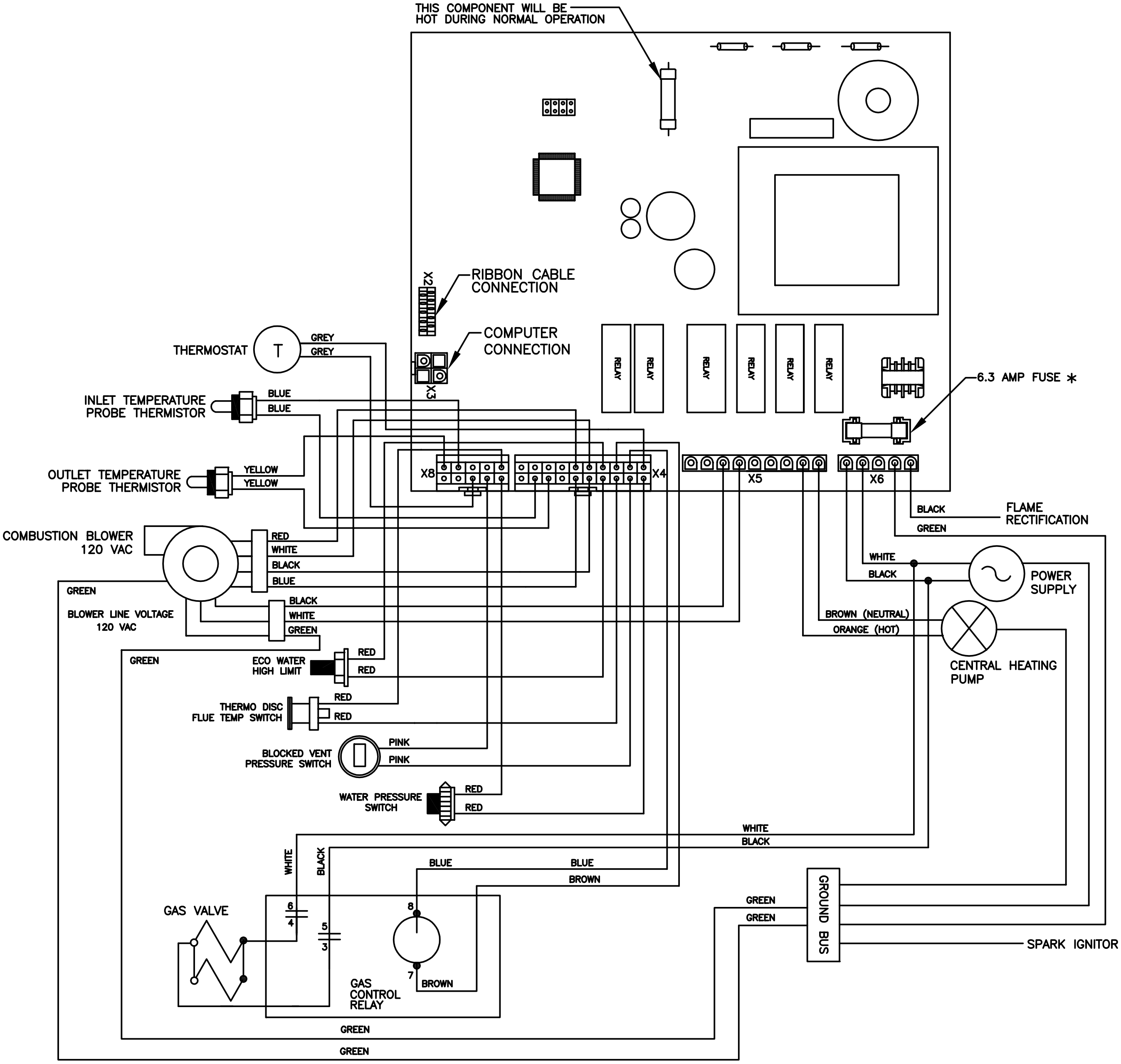
⚠ DANGER

IT IS EXTREMELY IMPORTANT THAT YOU CHECK FOR LEAKS WHEN RECONNECTING THE GAS VALVE AND MAKING SURE THE EXHAUST VAN IS NO LONGER BLOCKED. FAILURE TO DO SO MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH.

g. Re-connect the condensate hose to the outside connection.

****NOTE: When firing up the boiler for the first few times you may experience some fluttering of the gas burner that may result in a flame lockout. This is normal and will require you to re-cycle the unit until this clears up. This is caused by water still present in the combustion chamber.**

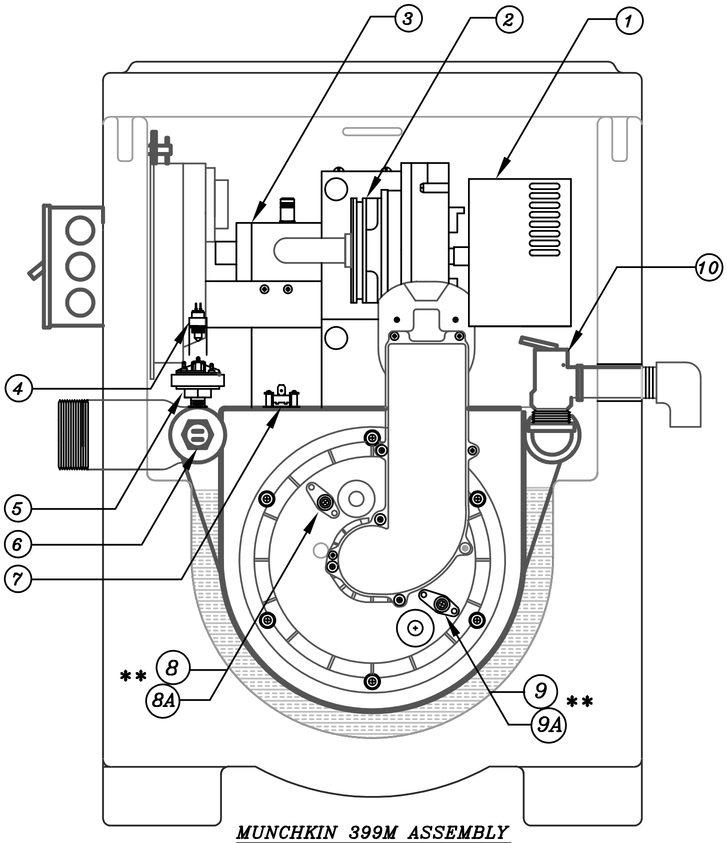
E. MUNCHKIN CONTROLLER



CONTROL WIRING LAYOUT

Fig. 8-1

* There is a spare 6.3 amp "slow blow" fuse included on the control cover. HTP p/n 7250-378 or you may purchase it from Radio Shack p/n: 270-1068
Caution: Do not replace with any amperage other than 6.3A



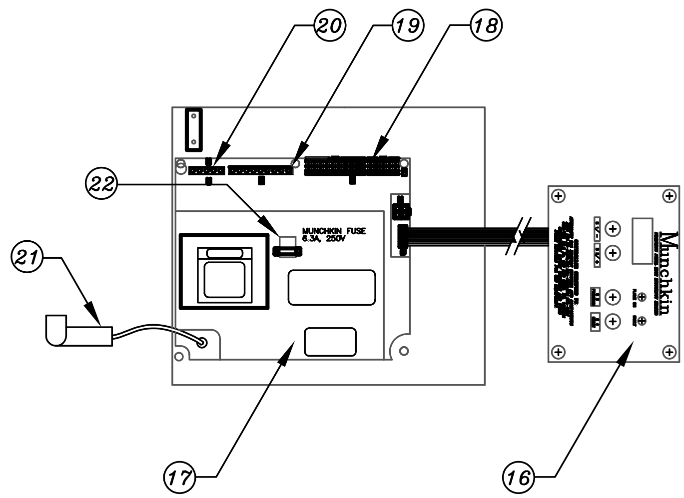
MUNCHKIN 399M ASSEMBLY
FRONT VIEW

*** THE LOCATION OF THE HOT SURFACE IGNITOR AND FLAME RECTIFICATION PROBE IS REVERSED FOR ALL HA MODELS*

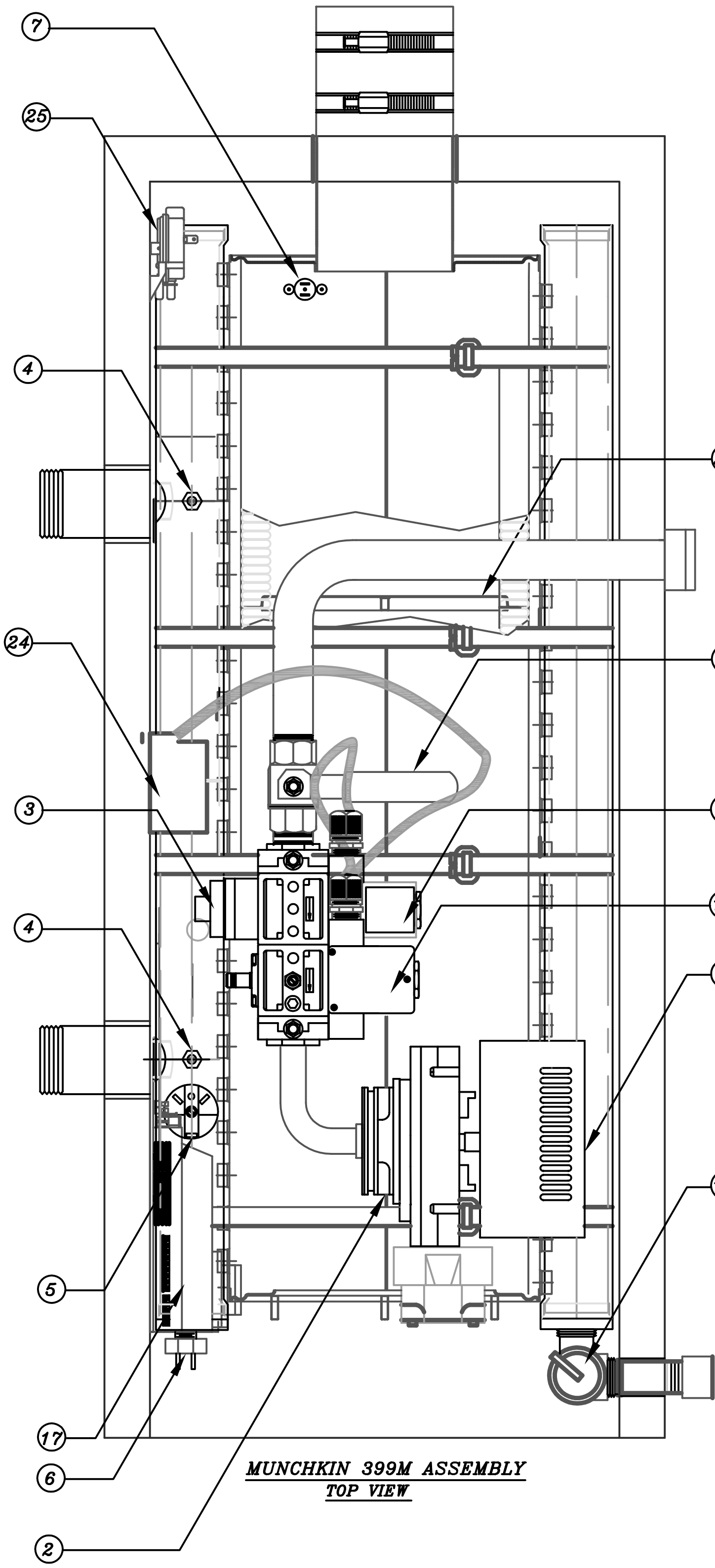
COMPONENTS ASSEMBLY

399M REPLACEMENT PARTS

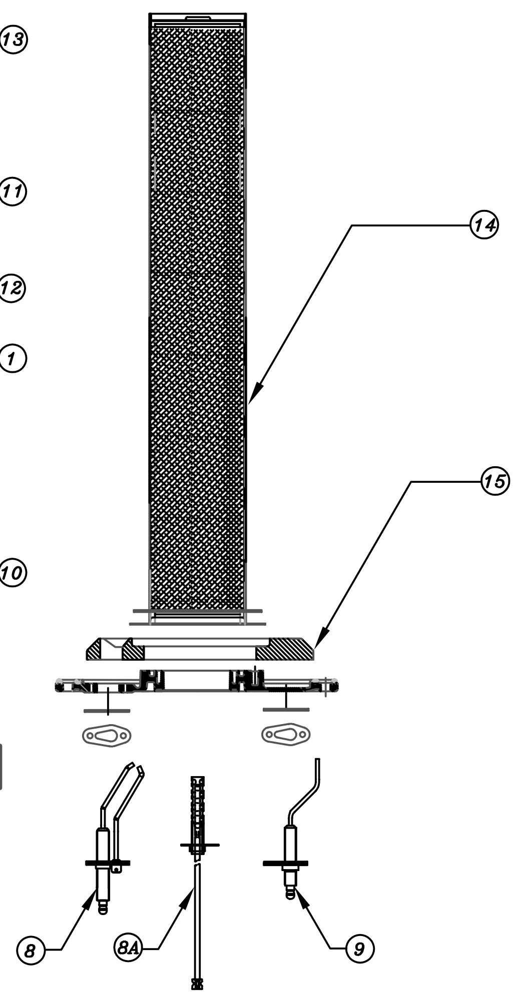
1. BLOWER MOTOR (INCLUDES GASKET)	7250P–518
2. AIR GAS MIXER	7250P–545
3. AIR/GAS VALVE ASSEMBLY	7250P–540
4. THERMISTOR INLET/OUTLET	7250P–059
5. WATER PRESSURE SWITCH	7250P–081
6. ECO HIGH LIMIT	7250P–019
7. THERMODISC FLUE ECO – 210° F	7250P–089
8. SPARK ELECTRODE (INCLUDES GASKET)	7250P–058
** 8a. FLAME RECTIFICATION PROBE (THIS LOCATION FOR HA MODELS ONLY)	7250P–049
9. FLAME RECTIFICATION PROBE (INCLUDES GASKET)	7250P–049
** 9a. HOT SURFACE IGNITOR (THIS LOCATION FOR HA MODELS ONLY)	7250P–279
10. RELIEF VALVE	7250P–219
11. MAIN VALVE SOLENOID	7250P–553
12. FIRST VALVE SOLENOID	7250P–552
13. GAS BALL VALVE	7250P–544
14. BURNER (INCLUDES GASKET)	7250P–502
15. MOLDED CERAMIC REFRACTORY	7250P–161
16. CONTROL DISPLAY BOARD (INCLUDES RIBBON CABLE)	7250P–332
17. 925 CONTROL BOARD (INCLUDES TRANSFORMER)	7250P–317
18. WIRING HARNESS LOW VOLTAGE (10 PIN/20 PIN)	7250P–535
19. WIRING HARNESS (9 PIN, 120 VOLT)	7250P–387
20. WIRING HARNESS (5 PIN, 120 VOLT)	7250P–390
21. SPARK CABLE (NOT REQUIRED ON HA MODELS)	7250P–392
22. CONTROL BOARD FUSE (110 VOLT, 6.3 AMPS)	7250P–378
23. CERAMIC TARGET WALL	7250P–160
24. GAS VALVE RELAY (CONTACT FACTORY TO ORDER)	
25. BLOCKED VENT PRESSURE SWITCH	7250P–150



925 CONTROL BOARD ASSEMBLY



MUNCHKIN 399M ASSEMBLY
TOP VIEW



399M BURNER ASSEMBLY